2003 ANNUAL REPORT

Wisconsin Transportation Research

WISCONSIN DEPARTMENT OF TRANSPORTATION

Wisconsin Transportation Research

This is a report of research, development and technology transfer activities carried out by the Wisconsin Department of Transportation and its partners.

These projects and services are funded through the State Planning and Research Program of the Federal Highway Administration, U.S. Department of Transportation.

This report covers Federal Fiscal Year 2003—beginning October 1, 2002 and ending September 30, 2003.

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Cover photo
Piles for the new La Crosse Cass Street Bridge over the Mississippi

Photographer
Ron Puestow, WisDOT District 5

Contents

WISCONSIN TRANSPORTATION RESEARCH

Catalyst for Growth

Ruben Anthony, Jr.
Deputy Secretary
Wisconsin Department of Transportation

The Wisconsin Department of Transportation is dedicated to ensuring the creation and safe operation of a balanced, efficient transportation system throughout our great state. Every step we take toward accomplishing this mission means economic development and jobs for Wisconsin—which is why transportation is a key part of Governor Doyle's Grow Wisconsin initiative.

"Through research we can find more cost-effective ways to build and operate our transportation infrastructure, and create better systems for running our agency."

Research, as described in this annual report, is a catalyst for our mission. Through research we can find more cost-effective ways to build and operate our transportation infrastructure, and create better systems for running our agency. New ideas, new approaches, based on careful analysis of good data, will help us meet the significant challenges ahead of us.

Our research investments address the whole range of our agency's needs—from planning and development to construction and operations and technology advancement, in all the modes of transportation. To meet these varied needs we employ a number of programs and partner with both academia and the private sector. We also invest in joint research with other states and in the many excellent programs of the U. S. DOT and the Transportation Research Board.

I invite WisDOT staff and all interested in the future of Wisconsin transportation to review this report of our recent efforts and see how research can be a catalyst for our economic growth.

Managing for Results

Kevin Chesnik
Administrator
Division of Transportation Infrastructure Development

WisDOT's Research Program has many customers—managers and staff at Hill Farms and district offices, contractors and consulting engineers, and the public that ultimately benefits from innovations we put into practice.

Bringing research results to our customers, however, requires planning and discipline, or our efforts can easily slip away. I encourage all involved with our research to apply project management principles for delivering the results of any important project on schedule, on budget and with the highest quality possible.

- Initiate the research project based on a demonstrated need for new knowledge.
- Plan the project carefully, including scope and schedule, identification of available resources, and a clear agreement on research objectives between project managers and investigators.
- Execute the project, with clear documentation of data gathering and analysis, and open communication among all stakeholders.
- Control the project through regular progress reports, monitoring for adherence to the plan, and take corrective action if needed.
- Close the project with a clear and complete report of results, appropriate implementation, and measure of benefits.

"Bringing research results to our customers…requires planning and discipline. I encourage all involved with our research to apply project management principles…"

The projects described in this annual report are a sample of the wide range of research we carry out with our partners at FHWA, academia and industry. Working together we have the opportunity to put research results to work and continue improving Wisconsin's excellent transportation system.

A Balanced Research Agenda

I am pleased to introduce the 2003 Annual Report of Wisconsin Transportation Research, prepared for WisDOT management and staff at Hill Farms and in our district offices and for our partners at U.S. DOT, in academia and in the construction and consulting industries.

Nina McLawhorn
Research Administrator
Research Coordination Section

In this report we review the progress of WisDOT's research programs during the past fiscal year, including details on completed projects that are already yielding value in the form of innovative processes and products that save time and money and improve quality.

We also provide information on the results of our investments in pooled fund research with other states and in the highly valuable programs of the national Transportation Research Board. Our goal is to use federal and state research dollars to carry out a balanced research agenda that advances the department's mission and provides practical, usable results to WisDOT staff and partners.

In each of the sections that follow we focus on key aspects of WisDOT's research efforts. I would appreciate your thoughts and suggestions as we strive to enhance the impact of research in the coming year.

Financial overview The charts on pages 4-7 present budget and project information for the fiscal year completed September 30, 2003 (FFY 2003) along with our estimates for FFY 2004. We use this year-to-year data to monitor and improve our funding and project selection decisions.

Four-year program evaluation On pages 8-9 we present the conclusions and some of the data from our review of the last four years of WisDOT's Research Program. We remain committed to existing structures and identify areas for future improvement.

Information services We continue to develop new products and services to meet the needs of central office and district office staff. On pages 10-11 we feature some of the ways we deliver new transportation information to our customers.

Completed projects The largest section of our report, on pages 12-26, highlights the work of dedicated investigators and project managers engaged in transportation research for WisDOT through several different programs: Council on Research, Technology Advancement Unit, Wisconsin Highway Research Program and pooled fund projects.

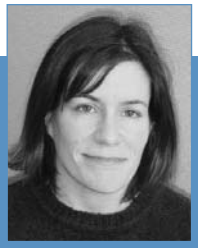
Progress of projects The six-page Reference Guide in the center of the report at page 16 provides a compact list of all 74 WisDOT-funded projects, their current progress and expected completion date. Pooled fund projects and project awards for 2004 are also listed.

National research In an effort to derive greater value from our considerable investment in Transportation Research Board activities, we showcase on pages 27-31 some of TRB's very significant products and resources, along with WisDOT and Wisconsin academic contributions to TRB committees.

Partners We are committed to continuing to work together with our research partners at FHWA, in academia, and in the contractor and consultant industries.

"Our goal is…a balanced research agenda that advances the department's mission and provides practical, usable results to WisDOT staff and partners."

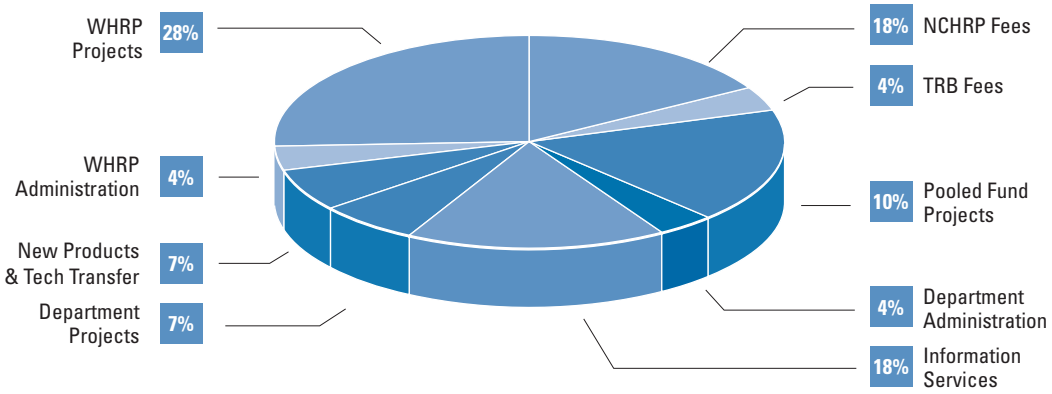
– Nina McLawhorn



Ann Pahnke
Program Analyst
Research Coordination Section

FFY 2003 SPR BUDGET

$3,009,874



Revenues

Federal Funds	$2,600,896
State Funds	408,978
Total	**$3,009,874**

Expenditures

100% Federal Funds

NCHRP Fees	$551,525
TRB Fees	120,095
MRUTC	0*
Pooled Fund Projects	293,366
	$964,986

80% Federal Funds/20% State Funds

Department Administration	$ 127,280
Department Projects	225,686
New Product Testing & Technology Transfer	196,453
WHRP Administration	114,588
WHRP Projects	849,214
Information Services	531,667
	$2,044,888

Total	**$3,009,874**

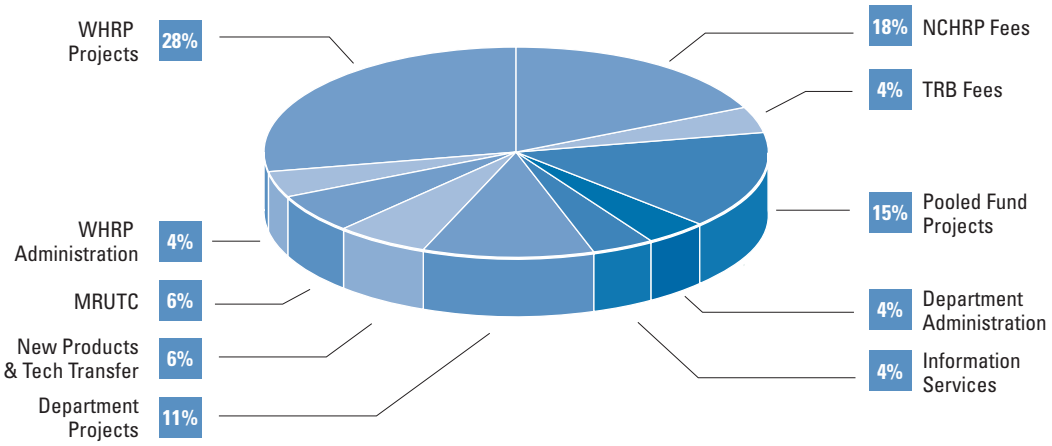
* FFY 2002 and FFY 2003 funds were obligated in FFY 2002.

Acronyms

COR	Council on Research
FFY	Federal Fiscal Year (10/1 through 9/30)
MRUTC	Midwest Regional University Transportation Center
NCHRP	National Cooperative Highway Research Program
RD&T	Research, Development and Technology Transfer
SPR	State Planning and Research
TAU	Technology Advancement Unit of the Bureau of Highway Construction
TEA-21	Transportation Equity Act for the 21st Century
TRB	Transportation Research Board
WDNR	Wisconsin Department of Natural Resources
WHRP	Wisconsin Highway Research Program
WisDOT	Wisconsin Department of Transportation

FFY 2004 SPR BUDGET

$3,125,000 (est.)



Estimated Revenues

Federal Funds	$2,600,000
State Funds	525,000
Total	**$3,125,000**

Estimated Expenditures

100% Federal Funds

NCHRP Fees	$551,525
TRB Fees	120,095
MRUTC	200,000
Pooled Fund Projects	466,000
	$1,337,620

80% Federal Funds/20% State Funds

Department Administration	$128,634
Department Projects	350,000
New Product Testing & Technology Transfer	202,000
WHRP Administration	128,634
WHRP Projects	841,468
Information Services	136,644
	$1,787,380

Total **$3,125,000**

TEA–21

The Transportation Equity Act for the 21st Century provided annual funding to state departments of transportation for research, development and technology transfer. WisDOT received the following research apportionments from State Planning and Research funds during the six-year life of TEA-21:

FFY 1998	$ 2,134,141
FFY 1999	$ 2,475,077
FFY 2000	$ 2,644,746
FFY 2001	$ 2,790,670
FFY 2002	$ 2,850,431
FFY 2003	$ 2,506,934
Total	**$15,401,999**

A new six-year transportation act is expected to be finalized in May 2004.

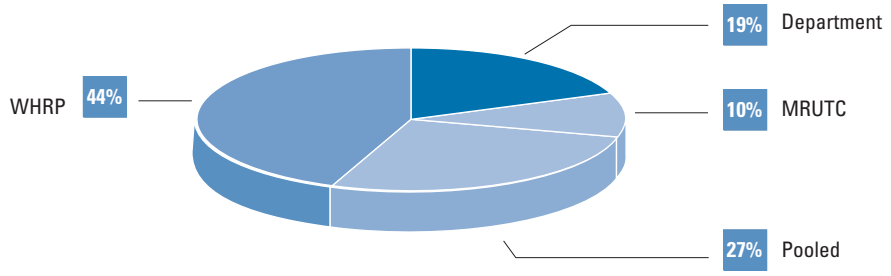
FFY 2003 PROJECT FUNDING

The Wisconsin Department of Transportation is dedicated to "creating transportation solutions through innovation and exceptional service." Effective research makes innovation possible. In order to continue improving our research efforts, we have taken as guiding principles the ***Seven Keys to Building a Robust Research Program.*** Published in 1999 by the National Cooperative Highway Research Program, this document (Synthesis Report 280) is a distillation of the best thoughts of DOT research managers, transportation agency administrators, industry leaders and academics from around the country regarding the attributes of robust research programs. These are the programs "that flourish and thrive, are vital and enduring, and that support the overall performance of the parent organizations."

Note: The charts on pages 6-7 show research project award amounts. Charts do not include program and administrative funding or NCHRP and TRB fees.

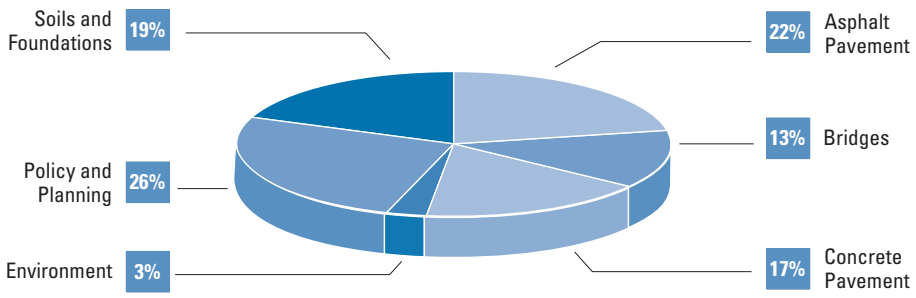
FFY 2003 Research Programs — Total Project Funding

$1,921,814



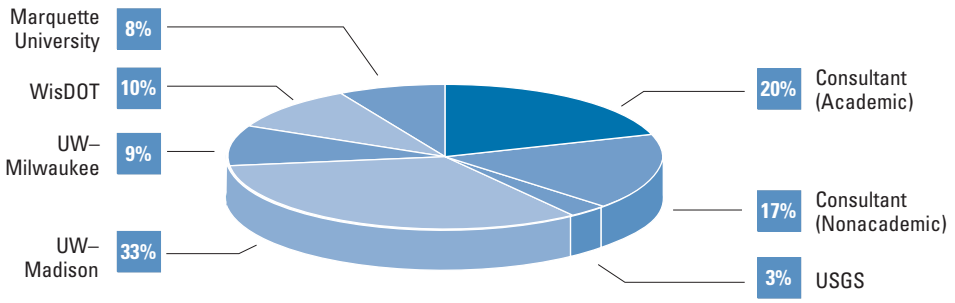
FFY 2003 Research Categories — Wisconsin Project Funding

$1,190,814



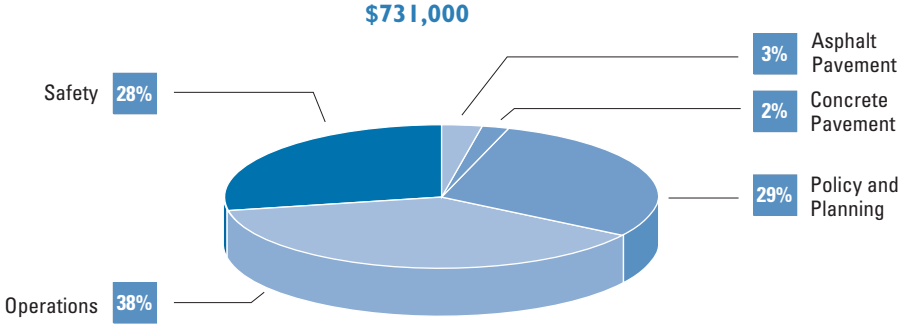
FFY 2003 Performing Organizations — Wisconsin Project Funding

$1,190,814



FFY 2003 Research Categories — Pooled Fund Project Funding

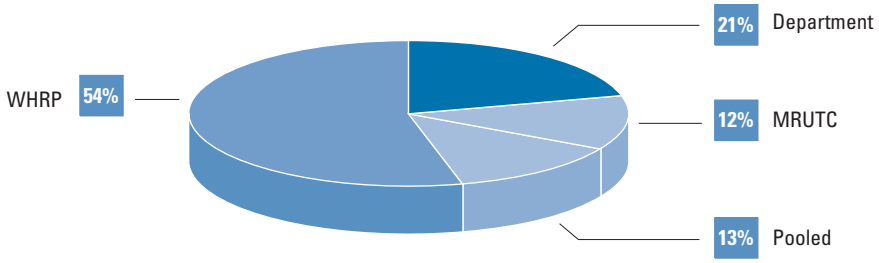
$731,000



FFY 2004 PROJECT FUNDING

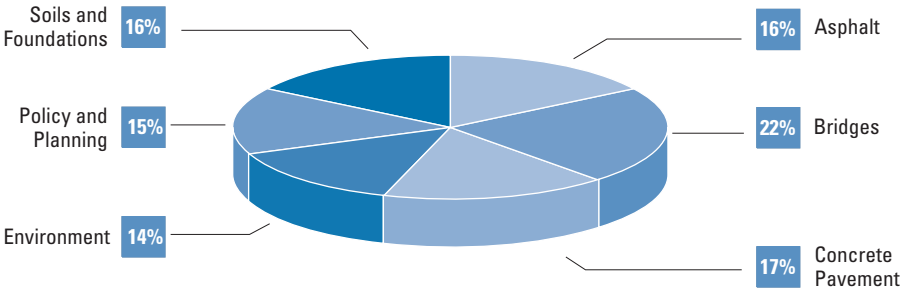
FFY 2004 Research Programs — Total Project Funding

$1,632,408 (est.)



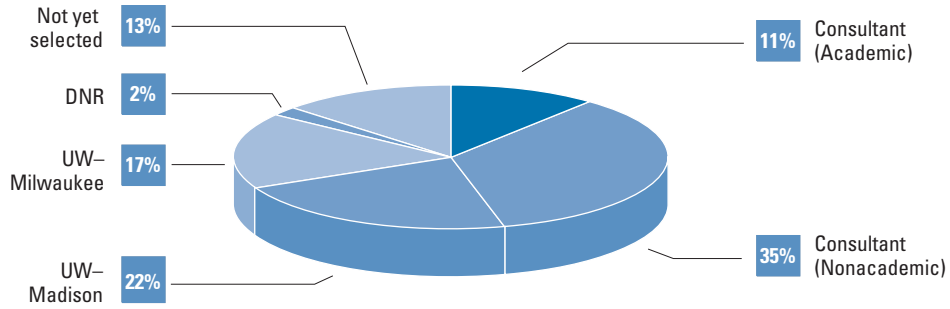
FFY 2004 Research Categories — Wisconsin Project Funding

$1,191,408 (est.)



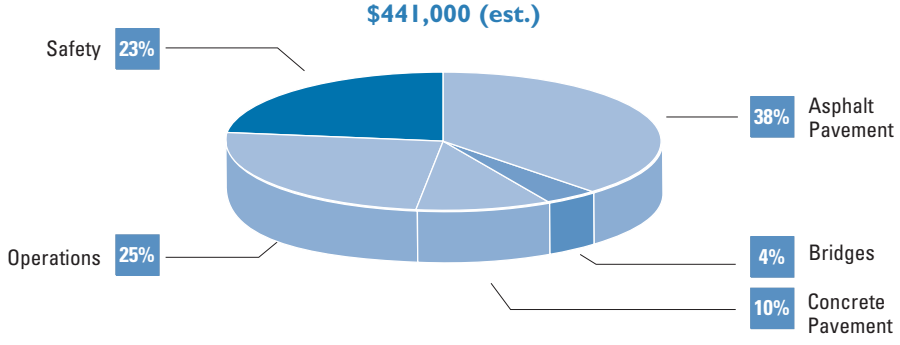
FFY 2004 Performing Organizations — Wisconsin Project Funding

$1,191,408 (est.)



FFY 2004 Research Categories — Pooled Fund Project Funding

$441,000 (est.)



7 Keys to Building a Robust Research Program

Found it on trust. Connect research to management concerns; assure management support for research efforts.

Market boldly at every stage of the process. Sell the need for and benefits of research to sponsors and users.

Root it in economics. Identify and quantify the economic benefits of research.

Make deals unabashedly. Form partnerships to leverage resources, access expertise and enhance credibility.

Insist on accountability from researchers, managers and partners.

Embrace policy research. Address strategic needs of management.

Empower the staff. Encourage generation of new ideas.

RD&T Four-year Program Evaluation

WisDOT's Research Coordination Section is responsible for overseeing awards, contracts, deliverables and implementation of research carried out through Part II SPR funds from the Federal Highway Administration. During 2003 RCS conducted a Program Evaluation covering four years' research activities in the following program areas:

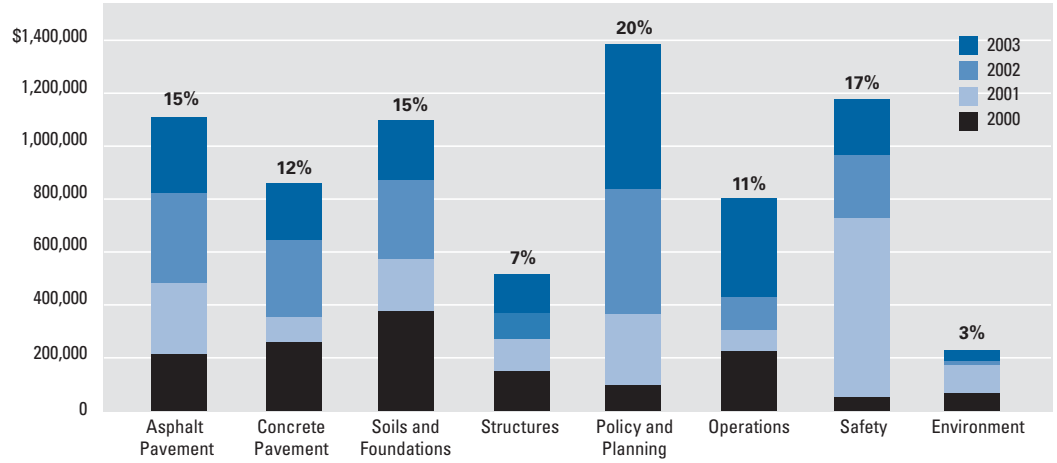
- National research (TRB and NCHRP)
- Regional research (MRUTC and other pooled fund projects)
- State research, development and technology transfer (COR, TAU and WHRP)
- Information services

We excerpt two charts from the Program Evaluation to show the range of research subject areas and investigators during the four years. We also highlight the conclusions we drew from the evaluation. We learned much about what is working well and identified areas for continued improvement in the coming years.

Charts are from the RD&T Program Evaluation – FFY 2000 through FFY 2003. The full report is available from the Research Coordination Section.

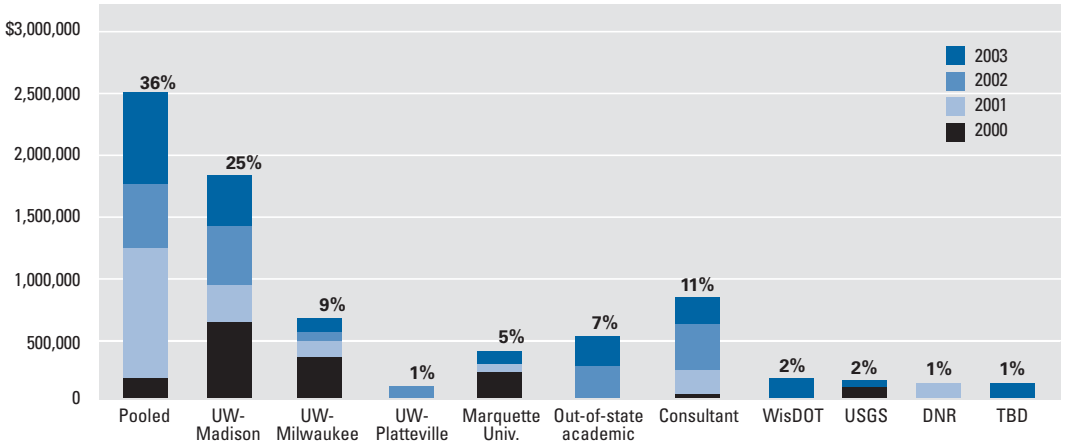
Contact Nina McLawhorn at nina.mclawhorn@dot.state.wi.us.

Project awards by research category (A-5)



- Transportation research can be categorized in many ways, and some projects fall into more than one category. Each project is assigned a primary research category.
- Both Wisconsin and regional research projects are included in this chart, but not national research, such as NCHRP projects, or in-house projects carried out by TAU.
- The higher value of safety research in 2001 reflects the one-time $500,000 award to the MRUTC for the Deer-Vehicle Crash initiative.

Project awards by investigator category (A-7)



- For purposes of the review, consultants are defined as private-sector firms carrying out research for WisDOT under a contract.
- Both Wisconsin and regional research projects are included in this chart, but not national research, such as NCHRP projects, or in-house projects carried out by TAU.
- Of pooled fund projects, 28% of their total value went to UW-Madison and an additional 10% to other Wisconsin universities.

Conclusions

Balanced agenda and budget

The program is balanced among engineering and multi-modal categories, but is focused on the front end of the process (i.e., research). Expenditures should be better balanced across the full range of RD&T activities.

Highly leveraged

WisDOT's RD&T program is highly leveraged but underutilized. Over 40 percent of the budget is allocated to national and regional research generating nearly $40 million of new transportation knowledge annually. Strategies are needed to apply these results in Wisconsin.

Faster delivery of innovation

There is a growing recognition, especially among WisDOT practitioners, of the need to speed information delivery and produce rapid response products by tapping resources in libraries and on the Internet.

New integrated model

WisDOT's multi-partnered approach could yield higher payoffs through greater commitments to communication, cooperation and coordination. A new integrative model is needed that meets both long-term and short-term needs and continues growing in-state expertise while using consultants and out-of-state resources when appropriate.

On time, on budget

Almost all projects are on budget, but only 31 percent are on time. While unforeseen circumstances and scope changes can create research delays, program partners should explore ways to create a sense of urgency in completing projects in a timely fashion.

High value

RD&T efforts are widely recognized as high-value activities for Wisconsin's transportation system.

Multiple objectives

Existing programs are working relatively well to address multiple department objectives including growing in-state academic expertise, addressing a full array of research needs, and becoming more customer-focused.

Clear partnerships

WisDOT needs to clearly identify its research priorities and define its needs for those from whom we buy services.

Customer focus

We are offering a wider range of services and products to meet varied needs: peer exchanges, expert review studies, pooled fund projects, traditional research, technology transfer, literature searches and synthesis reports.

Implementation and technology transfer

Increased emphasis on implementation of research results and technology transfer will increase RD&T program effectiveness.

Research/Library collaboration

The RD&T Program and WisDOT Library are jointly providing online communication products, technical resources and training to WisDOT staff. Participation in the growing Midwest Transportation Knowledge Network will further enhance these efforts.

Information Services

During 2001 and 2002 the Research Section surveyed WisDOT staff about their perceptions and expectations regarding the department's research. We also hosted a peer exchange in 2002 on information services for transportation professionals. WisDOT central and district office staff were joined by visiting team members from several other state DOTs, universities, FHWA and TRB.

We learned that WisDOT customers of the RD&T Program had a strong need for:

- Results of completed research
- Best practices from other states
- National trends and standards
- Innovative technologies that could be applied in Wisconsin

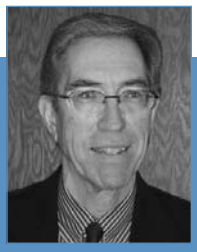
In addition, our engineers and other staff wanted this information delivered to them:

- In digested, summarized form, tailored to their particular needs and 'pushed' to them at their PCs
- With easy access to original, full-text reports

To begin meeting these needs, the RD&T Program contracted with CTC & Associates LLC to design and deliver a range of technical communication products and services for WisDOT professionals, highlighted on this page and the next.

The 1998 FHWA publication *Value of Information and Information Services* documents ways in which information services in state DOTs can

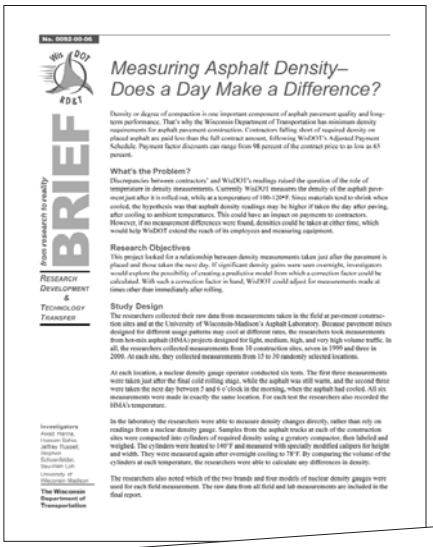
- reduce agency costs, accelerate technology development and improve operations
- speed the implementation of innovations, and
- lead to more effective decision making.



Patrick Casey
Principal
CTC & Associates LLC

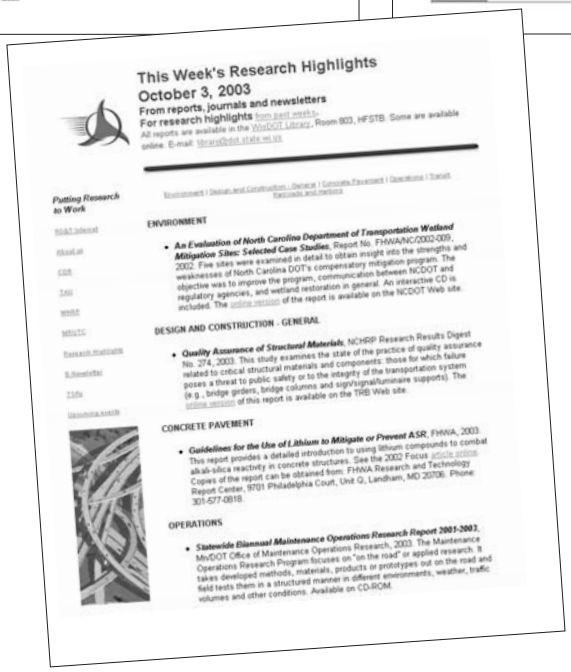
RD&T Briefs

Two-page summaries of every research project completed through the WHRP and COR programs.



Research Highlights

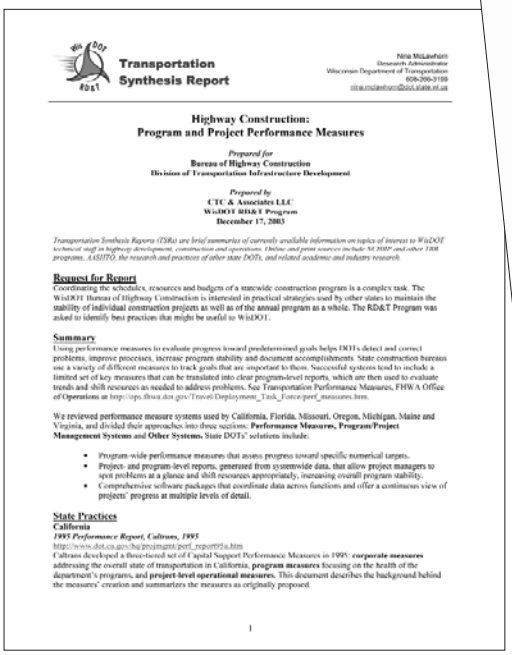
Biweekly digests of selected transportation research reports, journal articles and newsletters received by the WisDOT Library. Individual staff members are alerted by e-mail when items arrive in their area of interest.



Online access

All WisDOT RD&T communication products are available online to staff and partners.

www.dot.wisconsin.gov/library/research/reports



Transportation Synthesis Report

Highway Construction:
Program and Project Performance Measures

Prepared for
Bureau of Highway Construction
Division of Transportation Infrastructure Development

Prepared by
CTC & Associates LLC
WisDOT RD&T Program
December 17, 2003

Request for Report

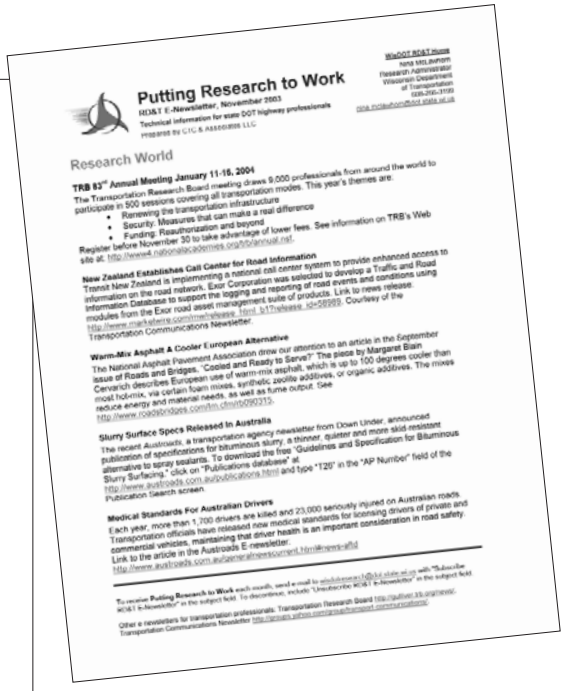
Summary

State Practices
California

Transportation Synthesis Reports

In 2003 more than 50 of these information summaries were prepared for WisDOT staff in the bureaus of Highway Development, Construction and Operations.

Topics included Design-Build, Crash Location Systems, Electronic Truckload Scales, Invasive Plant Species, Public Involvement, and Construction Project Performance Measures.



Putting Research to Work

RD&T E-Newsletter, November 2003

Research World

TRB 83rd Annual Meeting January 11-15, 2004

New Zealand Establishes Call Center for Road Information

Warm-Mix Asphalt A Cooler European Alternative

Slurry Surface Specs Released In Australia

Medical Standards For Australian Drivers

Monthly E-Newsletter

Putting Research to Work brings DOT staff and other transportation partners the latest technical news and best practices from the U.S. and around the world on:

- Design/Development
- Construction and Materials
- Operations
- Travel and Safety

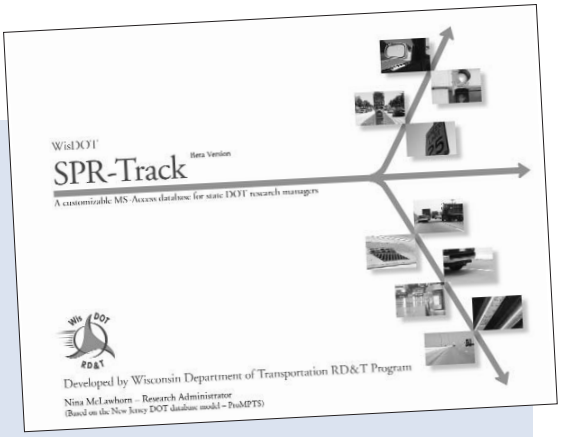
Quick Access to
Technical Information for
Transportation Professionals

Presented By
Patrick Casey, CTC & Associates
Kimberly Linsenmayer, CTC & Associates

Sponsored By
WisDOT RD&T Program
Nina McLawhorn, Research Administrator

Mining the Internet Training

This half-day class is presented at the WisDOT Training Center in Madison, at district offices, or online using Web conferencing technology. Participants learn 69 Quick Access Techniques for finding highly credible transportation information on Web sites and in online databases.



WisDOT
SPR-Track
Beta Version
A customizable MS Access database for state DOT research managers

Developed by Wisconsin Department of Transportation RD&T Program
Nina McLawhorn – Research Administrator
(Based on the New Jersey DOT database model – ProMPTS)

SPR-Track – Research project database

The Research Section continues to introduce new technology to streamline processes and gain efficiencies. Program Analyst Ann Pahnke worked with department IT professionals in 2003 to design WisDOT SPR-Track, a custom database that permits us to track and report on all aspects of research projects funded with FHWA State Planning and Research dollars.

"Thanks for this summary. It's a quick way to scan and see what's out there with a link if you want to look for more detail."
Dewayne Johnson
Waukesha District 2

"Very easy to scan for areas of interest. Keep up the good work!"
Rory Rhinesmith, Division. of Transportation Districts

"I have nothing to add to the synthesis, which is—as usual—comprehensive and yet concise."
John Corbin, Bureau of Highway Operations

"This [synthesis] was very helpful."
– Timothy McClain, Bureau of Transportation Safety

"...an excellent summary [for] staff who are our 'experts' in areas such as pavements, materials, etc."
Alan Rommel
Green Bay District 3

"I believe all of WisDOT will find this kind of publication useful."
Gary Whited, Division of Transportation Infrastructure Development

"Just wanted to let you know, I really appreciate your monthly newsletter."
Robert Pearson, WisDOT Bureau of Equity and Environmental Services

"Thank you. This is just what I have been looking for."
Leif Hubbard, Bureau of Highway Operations

COUNCIL ON RESEARCH

The Council on Research, composed of representatives from WisDOT's divisions and Executive Offices, works with the department's Research Administrator to identify needed research projects in areas such as policy and planning, operations, safety, transit and environment.

The four projects highlighted here are among those recently completed. All WisDOT staff and research partners are invited to suggest research topics that advance the mission of the department. Solicitation of new research occurs each January for funding the following October.

COR Members

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Alan Rommel
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0092-03-07
COMPLETED
December 2003

The Socio-Economic Benefits of Transit in Wisconsin

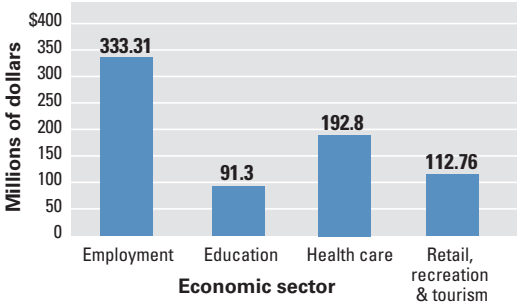
This research quantified the social and economic benefits of public transit service to Wisconsin's health care, employment, education, and retail, recreation and tourism sectors.

Relying on methodology developed by HLB Decision Economics Inc., researchers found that transit saves Wisconsin riders and taxpayers an estimated $730.2 million yearly in out-of-pocket savings to riders, public assistance spending and home health care costs. As riders spend their out-of-pocket savings, the economy enjoys an estimated $1.1 billion in output, $163.3 million in tax revenue and 11,671 new jobs created.

The study also measured the congestion management benefits of transit, finding that transit reduced congestion-related costs by $23.6 million in Madison and nearly $100 million in Milwaukee in 2002.

This research will help WisDOT educate decision makers about transit's economic benefits. Study findings were compiled into a white paper and a searchable database. A CD-ROM model will aid further research and simulations of economic benefits. The study also provides an evaluation and planning tool for the state and for communities with transit and those considering establishing systems. This research will be valuable in demonstrating the merits of transit in cost-benefit analyses and budget discussions.

Annual cost savings of Wisconsin transit



Khalid Bekka, *Investigator*
HLB Decision Economics Inc.

"This research was cutting-edge. It will help WisDOT educate decision-makers about transit's economic benefits, will help guide decision-makers in community planning and development, and will show the public that every dollar invested in transit comes back to them in tangible ways."

For more information, contact Project Manager John Etzler at john.etzler@dot.state.wi.us.

0092-03-08
COMPLETED
September 2003

WISLR Wisconsin Information System for Local Roads

Local Roads Communication Analysis

This study assesses the success of WisDOT communication tactics for asking local agencies to comply with a new roads rating requirement, and recommends communication strategies for future campaigns aimed at local governments.

WisDOT's 2001 outreach campaign for State Statute 86.302(2) produced a stunning 99 percent compliance rate even though there was not a direct incentive or penalty involved. The campaign was studied by Opinion Dynamics Corp. and Siddall Inc., who employed both qualitative and quantitative research to understand its success.

Among the findings: About 94 percent of localities prefer learning about new state programs, rules and requirements through letters; cities and

counties like e-mail and conference workshops, while towns are more likely to rely on association newsletters and local meetings. WisDOT should therefore adopt a layered approach to communication that uses a variety of methods. Developing effective motivational communication will require some "experiential" learning. Local and statewide conferences and meetings, training sessions and demonstrations are useful experiential vehicles.

Project findings will greatly benefit WisDOT and other public agencies that wish to communicate effectively with local units of government about programs and generate support. The department plans to launch a communication/implementation project based on this research to advise staff about the report's findings and recommendations.

Larry Shiman, *Investigator*
Opinion Dynamics Corporation

"Emphasize effective communication; make compliance quick, smooth and easy; play down the penalties. As WisDOT discovered, you will achieve compliance."

For more information contact Project Manager Scott Bush at scott.bush@dot.state.wi.us

0092-02-10
COMPLETED
January 2003

Evaluation of the Effectiveness of the Occupational Licensing Program

Wisconsin's occupational license allows qualifying residents with revoked or suspended driver's licenses the privilege of driving to work and other sanctioned destinations in order to provide for their families. Wisconsin is considered one of the most lenient states in granting occupational licenses, and the program permits loose interpretations of appropriate uses for the licenses.

This study, the first of its kind in the country, was undertaken to examine the effectiveness of Wisconsin's program, how well it is understood by the public and participants, and its impact on highway safety—does the program return suspended drivers to the road prematurely, potentially diluting its punitive and reformative purposes?

The Dieringer Research Group Inc. worked with the project's Technical Oversight Committee to frame the study in three phases: Situation Assessment, Current Perceptions and Profiles, and Occupational Licensee Assessment. Significant findings of the study included the following:

- Wisconsin's occupational license program seems to be working, keeping offenders employed while protecting the public. Participants had far fewer citations and crashes while in the program.
- The program is strongly supported by participants and experts. However, confusion surrounds interpretation of permitted activities requiring driving, and improvements were suggested.

Based on the results of this study and a previous WisDOT study on safety impacts of license revocation systems, recommendations were developed, including: educate the public, courts, law enforcement and other stakeholders about the program by reaffirming its purpose; clarify occupational license restrictions; and make absolute sobriety mandatory for licensees when appropriate.

This study reinforces the public safety intent of Wisconsin's program. Strong involvement by stakeholders and program administrators assures recommendations for program alterations that will sustain the spirit of its legislative intent while refining the letter of its restrictions.

Russell Brooker, *Investigator*
The Dieringer Research Group Inc.

"This project was the first in the nation to assemble a knowledge base of the effects of an occupational licensing program and perceptions of stakeholders that can be used to effectively shape the program in the future."

For more information, contact Project Manager Mitchell Warren at mitchell.warren@dot.state.wi.us

COR Mission

Guide, promote, prioritize and evaluate WisDOT's research, development and technology transfer activities as tools for achieving departmental goals.

Guiding Principles

- Provide input and a departmentwide perspective to the work of the Research Coordination Section.
- Promote, prioritize and evaluate department RD&T activities.
- Help increase awareness and use of existing research and best practices.
- Encourage effective analysis of research data and trends.
- Facilitate use of the most appropriate and cost-effective contracting options.
- Stress the importance of clear communication of research results.

Full-text final reports of these and other COR projects are online at:

www.dot.wisconsin.gov/library/research/reports

0092-02-08

COMPLETED

October 2002

Wisconsin's Off-Road Fuel-Tax Collection Process: A Midwestern Comparative Analysis and Assessment

Wisconsin and other states provide fuel tax exemptions for off-road or nonhighway use of fuel in agriculture, industry and marine recreation. Previous research indicates that substantial transportation revenue is being lost nationwide from fuel tax evasion. This study analyzes data from nine Midwestern states to determine the extent of evasion in Wisconsin and proposes corrections.

The study found that Wisconsin's annual consumption of tax-exempt fuel for agriculture exceeds that of the average Midwestern state by nearly $4 million, after controlling for total acreage and other key factors. Wisconsin also exceeds the other Midwestern states in use of the fuel for industrial purposes. Evasion is likely occurring.

Investigator Robert Eger III, formerly with the University of Wisconsin-Milwaukee, suggests that the combined federal and state experience with fuel tax administrative reform provides effective policies for fighting evasion. The federal effort forges collaborations among government agencies, toughening enforcement and enhancing resources. Eger proposes a series of policy options to close loopholes and improve enforcement.

The recommendations could produce significant benefits for WisDOT, the Wisconsin Department of Revenue and state highway users, including more efficient administration of the fuel tax law, improved integrity for the fuel tax program, and reclamation of major highway funding.

Robert Eger III, *Investigator*
University of Wisconsin-Milwaukee (formerly)

"This study reflects the increased emphasis on accountability within state government and WisDOT's commitment to taxpayers to work toward fairer administration of the fuel tax."

For more information, contact Project Manager Allyn Lepeska at allyn.lepeska@dot.state.wi.us

New COR Projects – FFY 2004

0092-04-04

Pollutant Loading to Storm Water Run-Off from Highways: Impact of a Highway Sweeping Program—Phase II

This study builds on previous work to evaluate the effectiveness of highway sweeping to reduce pollutants in storm water runoff from the pavement surface. Phase II will employ more rigorous data collection and analysis in order to confirm at higher confidence levels the results of Phase I. The study will also explore the effect of material collecting in the freeway median area.

0092-04-01

Development of a Mechanism to Measure Customer Satisfaction with Products and Services of the Department—Phase II

This project implements the survey developed in Phase I—including a full set of analyses of live data, full reporting of the results, and recommendations for how we can integrate the results into other data collection efforts and decision-making processes of the department. In addition to providing valuable guidance for future data collection efforts, the results of this project will also provide useful stand-alone data for making business decisions now and in the future.

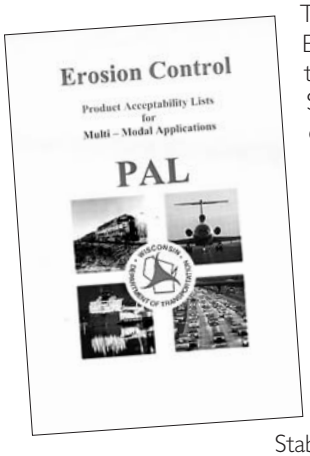
TECHNOLOGY ADVANCEMENT UNIT

The mission of WisDOT's Technology Advancement Unit is to support the department's strategic directions by addressing both existing and anticipated needs of Wisconsin's transportation system. TAU's responsibilities are concentrated in pavement studies and evaluations, technology advancement, and new products. TAU engineers coordinate WisDOT participation in a number of national research and technology transfer efforts, such as the Strategic Highway Research Program and the Long-Term Pavement Performance Study.

WI-06-03
APPROVED
May 2003

Preapproval for Natural Earth Poly Stable Plus (Soil Stabilizer Type B)

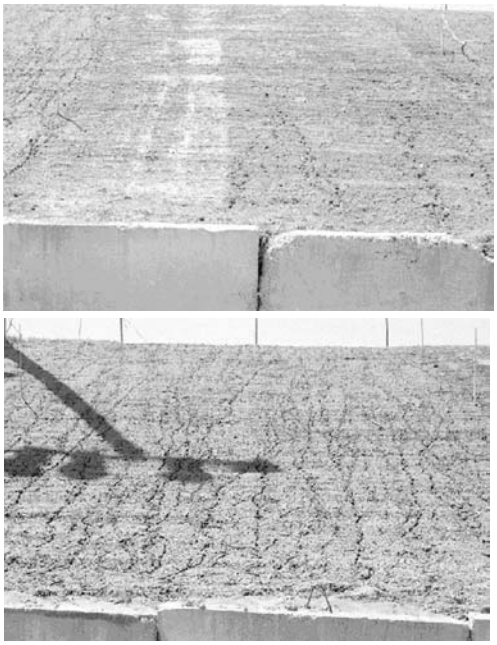
WisDOT requires erosion control products to be preapproved and included in its Erosion Control Product Acceptability List, published annually with semiannual updates and available online at *www.dot.wisconsin.gov/business/engrserv/pal.htm.*



TAU's New Products Engineer Peter Kemp and the Erosion Control Storm Water Committee consider manufacturers' requests for product listing after reviewing submitted data and conducting field tests on product samples.

Among the products approved in 2003 was Natural Earth Poly Stable Plus (Soil Stabilizer Type B), a natural chitosan polymer manufactured from seashells. Field testing of the product was carried out by WisDOT engineer Gilbert Layton, Wisconsin Rapids District 4, in cooperation with TAU engineers. Prior to the field test the polymer was subjected to required toxicity testing and an independent rainfall simulator test.

The chosen test site in Marshfield, Wisconsin, is marked by very heavy clay soils susceptible to rilling. Two side-by-side sections were established in November 2002 on a newly topsoiled 50-foot slope at the Marshfield Super Speedway: 1. A control section with only seed applied. 2. A test section with seed, lime and the candidate polymer applied. Temporary seed (winter wheat) as well as a permanent turfgrass seed mix was applied to the entire site. The lime was applied to the test section only to increase the pH of the soil.



Reduced rilling on the test slope (top) is compared to the control slope (bottom).

Monitoring of the test sections during the winter and spring showed rilling much more evident on the control section. The test plot showed an 87 percent reduction in rilling at the 10-foot point on the slope and 100 percent reduction on the upper 80 percent of the slope as compared with the control section. Based on these results, the product was approved for inclusion in the Product Acceptability List. Investigators noted that the lower cost of polymer soil stabilizers as compared with erosion mats make them a cost-effective best management practice.

Peter Kemp
New Products Engineer
Technology
Advancement Unit

"In addition to carrying out short-term technology advancement studies, our staff leads a group called the Technology Advancement Steering Committee. Members of TASC are from WisDOT's eight district offices and Central Office bureaus of Development and Construction.

"TASC meets regularly to exchange information about technical problems and ways to solve them with partners from the Federal Highway Administration, the Wisconsin Highway Research Program, the University of Wisconsin and other agencies."

David Larson, P.E.
Supervisor
Technology
Advancement Unit

Full-text final reports of these and other TAU studies may be found at *www.dot.wisconsin.gov/library/research/reports/pavements.htm*

FEP-03-03

COMPLETED

April 2003

Evaluating a Pavement Reinforcement Product to Prevent Reflective Cracks

Reflective cracks are often a problem when asphalt overlays are placed over existing pavements (asphalt or concrete) as a rehabilitation method. These cracks form when a joint or crack in the existing pavement reflects up into the asphalt overlay. In an attempt to find ways to delay or eliminate reflective cracking, TAU engineers evaluated the effectiveness of GlasGrid®, a glass fiber mesh pavement-reinforcing geotextile.

In 1990, test sections using two different types of GlasGrid were constructed on WIS 57 in Sheboygan County, a two-lane portland cement concrete pavement. Within six months, reflective cracks had already appeared in the test sections, and by the end of the fourth year, more reflective cracking had occurred in one of the test sections than in the control sections. After 10 years, 100 percent of the original cracks had reflected through the asphalt overlay in all the sections. In addition, most of the cracks that developed in the test sections were more severe than in the control sections.

Pavement reinforced with GlasGrid exhibited primarily Type III banded cracks (left), while pavement in the control section (right) typically developed less severe Type I cracks (less than half an inch wide). From final report, Figures d and e, pages 15-16. ▶

Based on study results and investigator recommendations, WisDOT does not use this product on existing PCC pavements with working joints and cracks, saving time and money that might have been spent on an ineffective technology. The benefit of research, in this case, came from negative findings.

Debra Bischoff
Investigator

Technology Advancement Engineer

WI-08-03

COMPLETED

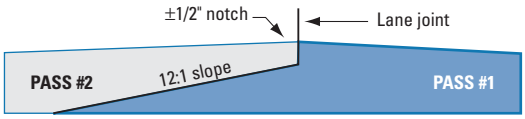
November 2003

Determining the Best Longitudinal Joint for Asphalt Pavements

To avoid traffic detours, it is common practice to place and compact hot-mix asphalt pavements one lane at a time. When constructing the conventional butt-type longitudinal joint, the second lane placed tends to have a slightly higher density where it butts against the first lane because its edge is confined during compaction. This density variation between lanes can lead to longitudinal cracking and raveling.

To address this problem, a 1992 study by the National Center for Asphalt Technology and Auburn University evaluated eight longitudinal joint techniques for asphalt pavements in Michigan and Wisconsin. The study found the wedge joint to be the best performer—in Michigan, but not in Wisconsin. This was believed to be due to Wisconsin's relative inexperience with the joint and lack of proper equipment at the time of the study.

In 1993, WisDOT organized this follow-up study on sections of US 61 in Crawford County to evaluate longitudinal joint techniques with an emphasis on the wedge joint. Based on density results and a 10-year longitudinal cracking evaluation, it was proven that the wedge joint can be successfully constructed in Wisconsin, as the wedge joint was found to be the best performer, especially when constructed with a steel side roller wheel or a tag-along roller. The steel side roller wheel was preferred by workers for its ease of use.



The best performing wedge joint included a half-inch vertical notch at the top of the wedge.

The wedge joint became an option on WisDOT projects in 1994 through a Special Provision Specification. Based on its success in this study and in practice on Wisconsin roads, TAU engineers have recommended that WisDOT make wedge joint construction a requirement rather than an option for most asphalt pavement construction.

Amanda Toepel
Investigator

Technology Advancement Engineer

WI-08-01

COMPLETED

December 2003

Polyurethane Foam Lifts Sagging Slabs

Over time, voids can develop beneath a road's concrete slabs, allowing the slabs to settle. When this happens, common methods of realigning the slabs include mud jacking, slab replacement and asphalt overlays. A newer technique uses an expanding high-density polyurethane foam to lift, realign, underseal and void-fill concrete slabs and bridge approaches.

Liquid polyurethane is injected under the slab through 5/8-inch holes drilled into the concrete. The liquid then expands and exerts a controlled pressure on the slab, raising it the desired amount, and then cures into a solid, stable replacement base material. The process can be accomplished, and traffic flow restored, within hours rather than the days or even weeks required for other methods.

In June of 2001, TAU engineers began a research project using Uretek brand foam to raise and realign two bridge approaches, one on I-39 in Columbia County and the other on US 14 in Dane County. A survey of the two projects in September of 2003 found that the material performed very well and can be installed quickly, but because of its cost, researchers recommended that it be used only on high-volume roads where closure time rather than cost is the critical factor. WisDOT could also save money in the future by using ground-penetrating radar to more accurately estimate the amount of material needed, and using concrete slurry to fill voids and polyurethane foam for slab lifting only.

A worker drills a hole in the slab through which the foam will be injected.

Khader Abu Al-eis, M.S.C.E., P.E.
Investigator

Technology Advancement Engineer

RED-11-02

COMPLETED

December 2003

Early Pavement Distress: Finding the Cause

When two pavement sections near Rhinelander began exhibiting significant longitudinal cracking within a few years of construction, a WisDOT team of individuals from Rhinelander District 7, TAU and Central Office set out to determine the cause. Built in 1991 and 1992, the segments of US 8 and US 51 were 9-inch doweled portland cement concrete pavements with centerline parting strips, constructed on a 6-inch dense graded base course.

Field and lab tests showed that inadequate flexural strength, prevalence of overweight logging trucks and use of the parting strip all contributed to the premature distress. For future PCC pavements, TAU engineers made three recommendations: 1) Implement construction specifications for PCC pavement flexural strength. 2) Use weigh-in-motion sensors to determine actual and projected vehicle loading, and use this information in designing the pavement's width and thickness. 3) Do not use a parting strip to develop the centerline joint. (In 2001 WisDOT discontinued use of parting strip.)

TAU engineers found that the relatively low flexural strength of the pavements was primarily attributable to a poor paste-aggregate bond. The glacial gravel coarse aggregates used in the pavement's base course have very smooth, rounded surfaces and often have a fine clay coating that interferes with bonding. One method engineers suggested to increase pavement flexural strength is to use crushed stone aggregate, consisting entirely of rough, fractured surfaces, for roads that are projected to have a high volume of heavy loadings.

◄ *Longitudinal cracks on US 51 (top) and US 8 (bottom) developed just a few years after the roads were constructed. From final report, pages 26-27.*

Equipment used in the pulverize and relay method of pavement reclamation (left to right)—vibratory pads foot roller, vibratory steel-wheeled roller and rubber-tired roller.

WI-02-03

COMPLETED

July 2003

In-Place Recycling for Pavement Reconstruction

On-site pavement reclamation methods have become increasingly popular in recent years. This study evaluated the cost-effectiveness of one reclamation method known as pulverize and relay. With this method, the existing pavement and a portion of the base course are pulverized, crushed, blended and compacted to form a base for a new asphalt overlay. This eliminates distressing of the new overlay caused by reflection of underlying pavement cracks and weak nonuniform areas. Recycling the existing pavement as a base course also eliminates the need for landfilling it, and preserves finite aggregate resources.

For this study, the pulverize and relay technique was used in three highway reconstruction projects in the early to mid-1990s. The technique was successful and cost-effective, and researchers recommended that WisDOT pavement designers continue using it to address severe pavement defects.

Pavement performance was generally better in the pulverize and relay test sections than in the control sections of standard asphalt overlays. Test and control sections had similar International Roughness Index readings during the summer, and the test sections performed better during winter. In general, the test sections also exhibited substantially fewer cracks. A life cycle cost analysis showed that while standard overlays are initially cheaper to construct, the pulverize and relay method is more cost-effective in the long run because the pavement requires less maintenance.

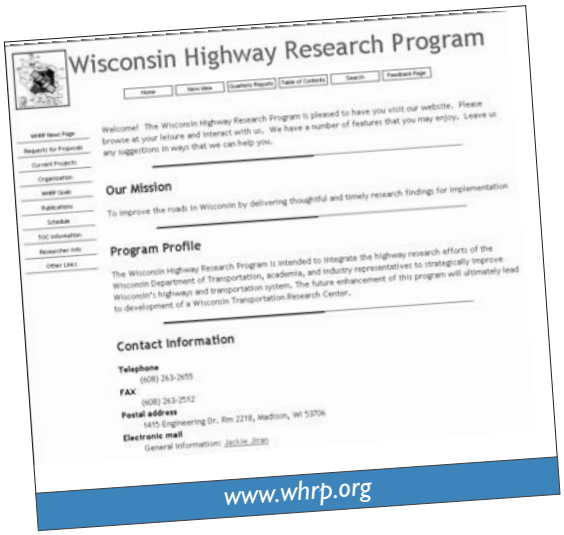
Joe Wilson
Investigator
Technology
Advancement Unit

WISCONSIN HIGHWAY RESEARCH PROGRAM

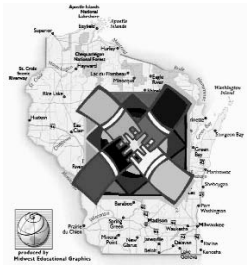
The Wisconsin Highway Research Program was established in 1998 to carry out materials and construction research for WisDOT in four key areas:

- Rigid pavement
- Flexible pavement
- Structures
- Geotechnics

Research projects in each of these areas are overseen by a Technical Oversight Committee chaired by a WisDOT engineer and composed of representatives from FHWA, contractors, consulting engineers and academia. Overall policy direction for WHRP is provided by a steering committee of stakeholders chaired by WisDOT's Research Administrator.



UW-Madison's Department of Civil and Environmental Engineering is contracted to administer WHRP, working with the WisDOT Research Section and members of the TOCs. The three projects highlighted here are among those completed in FFY 2003. All WisDOT staff and research partners are invited to suggest research topics that advance the mission of the department in the four designated areas. Solicitation of new research is carried out in January of each year for funding the following October.



Peter Bosscher, Ph.D.
WHRP Technical Director
UW–Madison

Summary of WisDOT Funding to WHRP

FFY	Annual WisDOT commitment	Steering Committee Awards			Contracted amounts*
		Projects	*Admin*	*Total*	
1999 [1]	$ 410,511	$ 285,511	$125,000	$410,511	$ 410,511
2000	500,000	709,131	125,000	834,131	838,341
2001 [2]	750,000	449,792	62,470	512,262	510,080
2002	1,000,000	979,074	133,509	1,112,583	1,067,083
2003	1,000,000	849,214	124,991	974,205	963,802
2004	1,000,000	871,468	128,634	1,000,102	84,603
Total	$4,660,511			$4,843,794	$3,874,420

* Includes contracts encumbered as of 9-30-03.

"This project has the potential to make a major contribution to building bridges in the state of Wisconsin—millions of dollars may be saved."

—Tuncer Edil

0092-00-14

COMPLETED

September 2003

Estimating Soil/Pile Set-Up

Over time, piles driven into soil actually increase in capacity. Depending on the soil type, this soil/pile set-up has been found to increase a pile's capacity by up to 12 times its initial value. Because piles for bridge structures cost WisDOT up to $2.9 million each year, accounting for set-up in pile design can help the state save a significant amount of money simply by more accurate estimation of pile capacity for bridges. Accounting for set-up can result in shorter piles, smaller sections, high capacities, smaller pile driving equipment, shortened construction time, etc., all of which save cost.

Piles under construction at the new La Crosse Cass Street Bridge over the Mississippi.

WisDOT engineers needed an alternative to the expensive process of conducting detailed pile set-up investigations during a pile test program. UW-Madison's Dr. Tuncer Edil and consultants from Wagner Komurka Geotechnical Group conducted an extensive review of current practices in set-up measurement and prediction, and recommended that the Standard Penetration Torque Test (performed using a split-spoon sampling and conventional drill rig) be further investigated as an exploration-phase field test to predict set-up.

Investigators believe this method may, with further research, eventually lead to significant savings for bridge building in Wisconsin.

◄ **Tuncer Edil**, Ph.D., UW- Madison, **Van E. Komurka and Alan B. Wagner**, Wagner Komurka Geotechnical Group, Inc., *Investigators*

0092-02-14b

COMPLETED

October 2003

Rapid Strengthening of Reinforced Concrete Bridges

Wisconsin roads feature over 13,000 bridges, including many rapidly deteriorating concrete spans from the 1930s and 1940s. Even 20-foot, two-lane structures can cost well over $100,000 to replace.

County workers install fiber-reinforced polymer strips to extend bridge life.

Hence, officials greatly prize strengthening methods that can temporarily postpone replacement. One such method requires adhesive application of fiber-reinforced polymer strips to stressed beams. Inexpensive, but takes days. Crumbling surfaces must be smoothed. Epoxy must be applied, then allowed to cure for 24 hours.

WHRP turned to UW-Madison professor Larry Bank to find an alternative. Dr. Bank attached FRP strips with steel pins inserted by powder-actuated drivers. This novel mechanical process requires little surface preparation, little time, and little money. While conventional FRP strips quickly split around nails, Bank's team drew on four years of previous work at UW-Madison and at Army Corps of Engineers facilities to develop a strip with multidirectional fibers resistant to splitting.

The result: the strengthening of an Edgerton bridge to serviceability, requiring of a county crew only 37.5 hours of labor and simple equipment, and costing $8,000. WisDOT now possesses a unique, inexpensive and quick way to shore up decaying bridges for three to five years, buying time to marshal the funds for replacement.

"With very little capital investment this method provides temporary upgrading for three to five years for those bridges that are planned to be replaced." – Lawrence Bank

◄ **Lawrence C. Bank**, Ph.D., P.E. **Michael G. Olivak**, Ph.D., **Dushyant Arora, and David T. Borowicz**, M.S.C.E., UW–Madison *Investigators*

0092-02-05

COMPLETED

July 2003

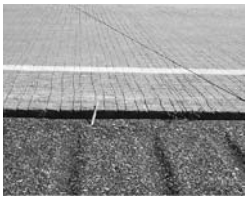
Performance of Shoulders Adjacent to Concrete Pavements

Asphalt shoulders adjacent to portland cement concrete pavements have been giving fits to maintenance crews around the state. Within months after construction, excessive cracking and other forms of distress frequently force crews to repair shoulders in high-volume traffic. In addition, shoulder heave creates damaging effects on snowplow blades.

Clearly, better shoulder designs are necessary, but a lack of data on costs and performance characteristics of asphalt and concrete shoulders limited such efforts—that is, until WHRP called on UW-Platteville professors Samuel Owusu-Ababio and Robert Schmitt to develop improved design guidelines.

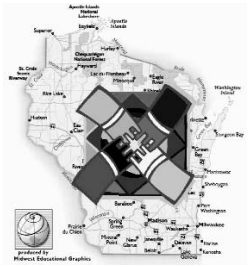
The investigators surveyed shoulder conditions at 133 Wisconsin sites—nearly 300 miles of roadways. The pair developed an approach based on distress index factors to evaluate paved shoulder conditions. The study produced design guidelines, including suggestions for paved shoulder layer thicknesses and widths, and recommended sealing the longitudinal joints between asphalt shoulders and the PCC mainlines.

Ultimately, this research brings WisDOT a big step closer to integrating shoulders into pavement management systems, and allowing crews to anticipate the timing and types of distresses likely with specific paved shoulders. It will save money, improve driving conditions, extend the lives of snowplow blades, and spare crews overexposure to traffic.



The severity of shoulder settlement (left) and heave (right) are characterized as part of the new Paved Shoulder evaluation method developed by the investigators. See report, pages G17-18.

◄ **Samuel Owusu–Ababio**, Ph.D., P.E., and **Robert Schmitt**, Ph.D.
UW-Platteville
Investigators



"Shoulders are an integral part of the highway system, but we haven't paid much attention to them. With this research we can begin to set performance criteria for shoulders and incorporate shoulder design and performance characteristics as part of the overall WisDOT pavement management program."

– Samuel Owusu-Ababio

"The models developed in this study can lead to better timing for shoulder maintenance treatments."

– Robert Schmitt

New WHRP Projects — FFY 2004

0092-04-05

Asphalt Pavement

Guidelines for Surface Preparation/Rehab of Existing Concrete and Asphaltic Pavements Prior to Asphaltic Concrete Overlay

This research will help WisDOT develop guidelines for pavement surface preparation and rehabilitation using asphalt overlays. Tasks entail review of current state and national practices, field comparison and analysis. Expected benefits are more uniform, high-quality surfaces of rehabilitated pavements and more accurate assessments of life cycle costs.

0092-04-06

Asphalt Pavement

Life Cycle Cost Analysis of SMA Pavements and SMA Application Guidelines

Stone matrix asphalt pavements, used by WisDOT since the 1990s, will undergo a full economic life cycle cost analysis in this project. Objectives are to compare SMA and other standard Wisconsin asphalt mixtures based on parallel life cycles, required maintenance and performance. The research will provide guidelines for cost-effective selection of mixture type.

0092-04-07

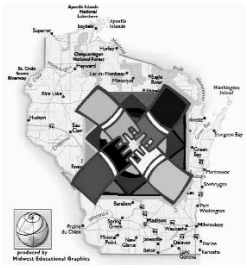
Asphalt Pavement

Testing Wisconsin Asphalt Mixtures for the AASHTO 2002 Mechanistic Design Procedure

The updated AASHTO asphalt mixture procedure (2003 release) relies on new performance testing measures of asphalt mixture resistance to rutting and fatigue cracking. This research will put Wisconsin asphalt mixtures to the same tests to determine the suitability of the AASHTO design specifications for use in this state, ultimately improving asphalt paving in Wisconsin. *(continued on next page)*

Full text final reports of these and other WHRP projects are online at:
www.dot.wisconsin.gov/library/research/reports

New WHRP Projects — FFY 2004 *(continued)*



0092-04-13

Bridges

Reducing Shrinkage Cracking of Structural Concrete Through the Use of Admixtures

Admixtures—such as steel fibers or water-reducing materials—have had limited success at controlling cracking in high-performance concrete bridge decks throughout Wisconsin. This study considers other admixtures, including coal combustion products, for reducing cracks. Enhanced concrete will be evaluated in terms of structural properties and performance, resulting in more durable decks.

0092-04-14

Bridges

Health Monitoring of Bridge Structures and Components Using Smart Structure Technology

The relatively young technology of sophisticated bridge structural health monitoring systems supports a disparate array of products of varying capabilities. This study will identify the most promising systems for applicability to existing and future bridges in Wisconsin, in order to improve preventive maintenance efforts and to develop more durable bridge designs.

0092-04-15

Bridges

Rapid Response Bridge Non-Destructive Evaluation

Current non-destructive evaluation methods for bridges typically suit steel bridge members, but not concrete. This study identifies and demonstrates NDE methods to assess conditions, identify defects, plan maintenance and inspect traffic accident damage for both steel and concrete structural members. Results will allow quick response to potential problems or maintenance needs.

0092-04-11

Concrete Pavement

Research and Development of the Application of FHWA's HiperPav Model to Wisconsin

The HiperPav computer program simulates the first 72 hours after a concrete pour, the period in which much of the future strengths and stresses of pavement originate, but its inputs reflect common national applications, not specific Wisconsin conditions. This research hones HiperPav for local use, to maximize quality and construction procedures and improve long-term performance.

0092-04-12

Concrete Pavement

The Effects of Aggregate Coating and Films on Concrete Performance

A previous WisDOT study found fine aggregate coatings had significant deleterious effects on concrete performance. This expanded study will develop a statewide database of aggregate cleanliness and source, identify coatings and test concrete made with them, and develop methods for detecting damaging coatings. The study will develop methods for mitigating negative effects to allow use of aggregates from all state sources.

0092-04-08

Soils and Foundations

Application of Electromagnetic Geophysics (EMG) Technology to Subsurface Investigations

This project will identify various electromagnetic geophysics methods and applications for their use in assessing subsurface soil conditions. By clarifying the usefulness of EMG in studying potential construction sites, this study will open the black box containing this sophisticated technology, with the aim of using EMG to hone designs to specific site characteristics, producing better pavement.

0092-04-09

Soils and Foundations

Investigation of Standard Penetration Torque Testing (SPT-T) to Predict Pile Performance

Recent WHRP research (0092-00-14) identifies the SPT-T as a promising method for determining pile setup, the increase in pile capacity over time. This study will develop standardized procedures and equipment recommendations for SPT-T in Wisconsin. A precursor to using setup data for design of shorter, less expensive piles, this study will ultimately save WisDOT in construction costs.

0092-04-10

Soils and Foundations

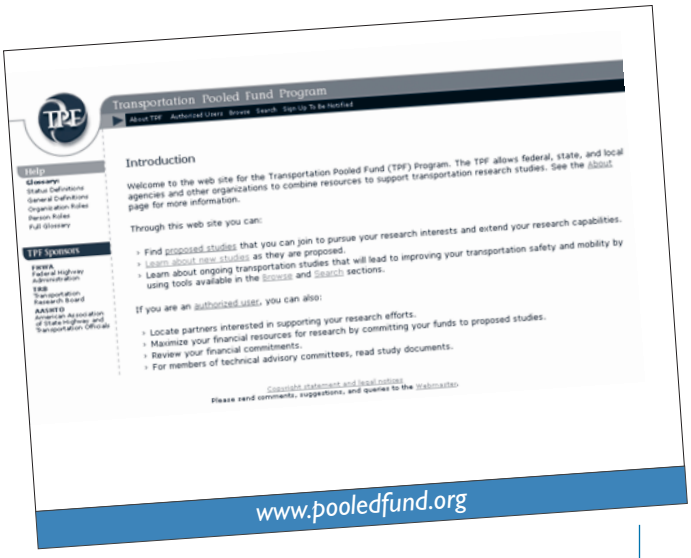
Monitoring and Evaluation of WisDOT-Constructed Fly Ash Stabilized Subgrade

To date, WisDOT's use of fly ash to stabilize silt- or clay-heavy subgrade has been too limited to provide conclusive recommendations for further use. This study will evaluate over 30 months a 3- to 5-mile pavement section to be built in 2004 with fly ash-enhanced subgrade, yielding more conclusive data on this promising, potentially cost-saving and pavement-improving subgrade stabilization method.

POOLED FUND PROJECTS

Pooled fund studies with other states allow WisDOT to leverage annual investments into millions of dollars of research. When state DOTs face common problems, it makes sense to combine resources, avoid duplication and find solutions through cooperative research. Pooled fund projects are coordinated through a Web-based solicitation and tracking process sponsored by FHWA, TRB and AASHTO.

Following are highlights of just a few of the 28 pooled fund projects in which WisDOT currently participates. Further details and contact information for each project are on the Pooled Fund Web site and on WisDOT's Research and Library pages.



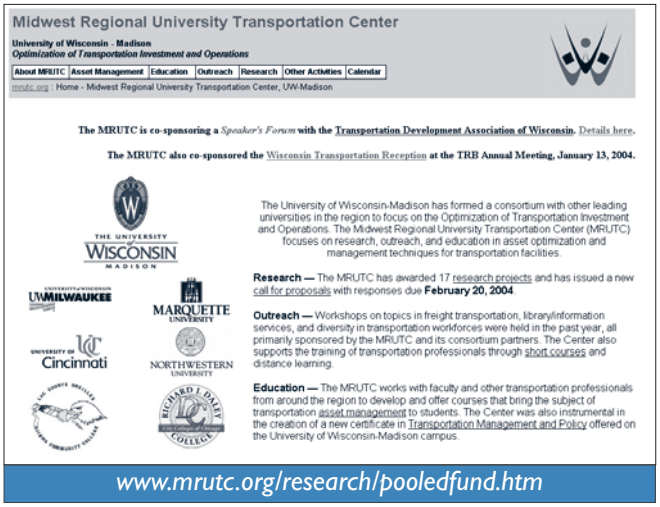
TPF-5 (036)

Transportation Asset Management Research Program

Wisconsin is the lead state for the Asset Management Pooled Fund administered by the Midwest Regional University Transportation Center at UW-Madison. Five other states currently participate. WisDOT's annual contribution provides major funding for this project, which was established "to enable participating states to leverage limited resources in an ongoing program of synthesis, research and analysis to facilitate implementation of asset management." The following research projects have been supported in whole or in part through the Asset Management Pooled Fund:

- Support and Administration of the 5th National Transportation Asset Management Conference
- GIS Tool to Measure Performance of Winter Highway Operations
- System Management and Monitoring—Providing a Continuous, Real-Time Evaluation of the Columbus Metropolitan Freeway Management System
- Incorporating Road Safety into Pavement Management: Maximizing Surface Friction for Road Safety Improvements
- Capital Preventative Maintenance
- Synthesis of Best Practices for Data Integration
- Short Course on Incorporating Operations and Maintenance into the Design of Transportation Facilities
- Maintenance Quality Assurance Peer Exchange

MRUTC is a consortium of UW–Madison and six other Midwest universities dedicated to the complementary goals of research, education and technology transfer in the area of transportation asset management. Other consortium members include University of Wisconsin-Milwaukee, Marquette University, Northwestern University, University of Cincinnati, Lac Courte Oreilles Ojibwa Community College, and Richard J. Daley College in Chicago.



Ernie Wittwer
MRUTC Director
UW–Madison

SPR-2 (207)

Transportation Management Centers

A common sight along busy roadways—portable, changeable message signs—didn't always ensure traffic was moving efficiently. It wasn't until last year that their impact on driver behavior was studied and implemented into new guidelines for effective operation, issued by the Transportation Management Center (TMC) Pooled Fund Study.

State Traffic Engineer John Corbin feels the study has had an effective first four (of seven) years. "It has produced some very usable products," says Corbin. Participants from 27 organizations identify real problems, study them, and issue improved procedures to address them. "For each of the completed projects, we've been able to develop a product," Corbin reports.

The Milwaukee Traffic Control Center uses both fixed and portable changeable message signs to give timely information to highway users.

Synergy among participants enables WisDOT to employ research results even before they've been released. "Rather than us sitting by and waiting for the pooled fund study to provide information for us," Corbin explains, "we've been able to implement results, then coordinate our efforts with the others in the study."

Like other pooled fund programs, the TMC study offers networking with knowledgeable colleagues and a strong research investment. For an annual expenditure of $75,000, WisDOT secures the results of $300,000 studies like the portable sign operating procedures.

"Quite frankly," says Corbin, "it wouldn't be feasible to do some of the things we've been able to do with the pooled fund study if we had to go it on our own." Review accomplishments of this study at *http://tmcpfs.ops.fhwa.dot.gov/index.cfm.*

John Corbin, P.E., P.T.D.E.
State Traffic Engineer

SPR-3 (017)

Midwest States Crash Testing Program

Taking a small Ford sedan out for a lovely summer drive and ramming it into a guardrail may be critical to designing safe roadside barriers, but it is expensive. Beth Cannestra, Chief Roadway Development Engineer for WisDOT and liaison to the Midwest States Crash Testing Program, figures each small car crash test costs $30,000.

Full-scale crash testing through the Midwest States Crash Testing Program assures that states' barriers meet FHWA standards.

"It's just not the kind of testing we as a state could take on," she says. Unless the state joins a dozen other states that fund this 14-year-old, $500,000-per-year pooled fund study at the University of Nebraska-Lincoln. It crashes a lot of cars.

This program proved indispensable in the mid-1990s, when FHWA mandated upgrades in roadside safety hardware. Its value continues. "We're constantly updating designs based on the research," says Cannestra. As ever-larger vehicles take to the roads, barrier designs must change to meet federal requirements. "You pretty much need to do full-scale crash testing to know whether it meets the standard or not," she explains.

Whether it's helping guide WisDOT on tethering temporary concrete barriers, or pointing toward a new 31-inch-high guardrail designed to stop today's larger vehicles, this program makes a name for itself. That 31-inch barrier has been dubbed the "Midwest Guardrail." See more at *www.mwrsf.unl.edu/*.

Beth Cannestra, P.E.
Chief
Roadway Development Section

TPF-5 (066)

Materials and Construction Optimization for Prevention of Premature Pavement Distress in PCC Pavements

Few headaches match that of the engineer who presides over a stretch of highway showing spalling and cracking only a couple of years into its life. The 13 states participating in this pooled fund study have tired of pulling out the aspirin; they'd rather prevent the migraine altogether.

The goal of this joint project will be to assure that PCC pavements, like this new construction on US 151 in Lafayette County, continue to provide high quality service for many years to come.

This five-year program examines mixes and designs from the drafting table to the pour site. Phase one, which began last year, focuses on data collection. Phase two, planned for this summer, entails touring participating states with a field trailer armed with a battery of state-of-the-art testing equipment to gather data and test the tests. Phase three will focus on developing training manuals and programs on testing and materials.

Jim Parry, Physical and Chemical Tests Supervisor with WisDOT, looks forward to seeing the field trailer. "They've kind of scoured what's out there for the latest and greatest tests," says Parry.

With a half-dozen upper Midwest states involved, Parry expects a regional emphasis that will benefit Wisconsin. "Our problems with respect to environment and deterioration tend to be similar" to the other participants', according to Parry. "The regional aspect is a good way to share the research cost."

Jim Parry, P.E.
Supervisor
Physical and Chemical Tests

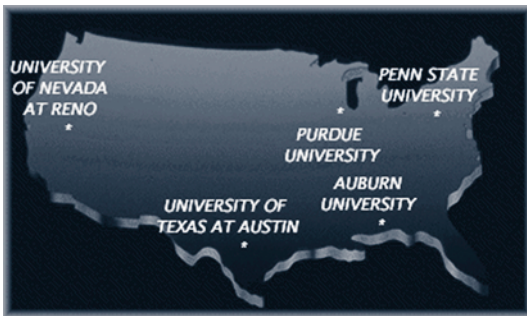
TPF-5 (021)

Base Funding for the North Central Superpave Center

When WisDOT adopted Superpave design standards for asphalt pavement in 2000, the specifications were hardly new to us. Wisconsin has been one of nine states and one Canadian province participating since 1995 in the pooled fund program Base Funding for the North Central Superpave Center, one of five such regional centers across the United States.

Superpave's promise is also its challenge. By offering design criteria adaptable to each specific site's materials and environmental characteristics, Superpave encourages designers to consider a range of inputs and practices. However, when a design problem arises, the impulse to consider procedures used elsewhere faces the Superpave conundrum of comparing apples to oranges.

"Our decisions are pretty much based on testing," says John Volker, Chief Quality Management Engineer for WisDOT. By promoting and evaluating the same testing protocols in all NCSC states, the Center makes possible a comparison of an asphalt



installation in Wisconsin Dells with another in, say, Lincoln, Neb. "You commit to running the same tests," Volker explains. "It keeps us from having to reinvent the wheel."

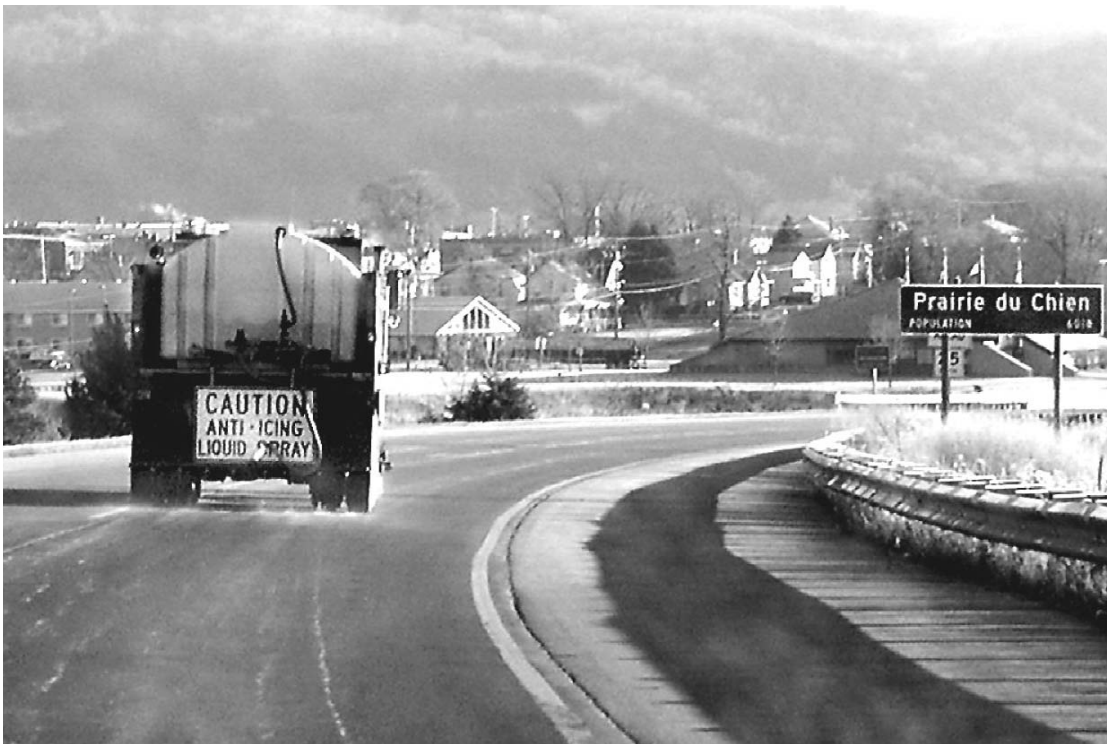
The NCSC focuses on training and on testing equipment and procedures used to examine mix designs. Last year it spent $438,000 on its activities. Wisconsin paid $25,000 for participation.

According to Volker, this is a strong investment: "We're getting our money's worth."

John Volker, P.E.
Chief Quality Management Engineer

◄ *The North Central Superpave Center at Purdue University is one of five regional centers dedicated to ongoing testing and certification.*

Take a look at ***http://ce.ecn.purdue.edu/~spave/.***



Wisconsin is the lead state for a new winter highway maintenance pooled fund study.

►

TPF-5 (092)

Test and Evaluation of Materials, Equipment and Methods for Winter Highway Maintenance

Every April, Tom Martinelli, WisDOT's Winter Operations Engineer, meets with colleagues in surrounding states to talk snow and ice and road salt. Every year, a new product for winter maintenance appears on the horizon—like roadside weather sensors that automatically activate deicer sprayers, or road salt mixed with molasses to stick to pavement.

But snowplows wear out prematurely, deicing dispensers clog, and engineers learn to view every new solution with skepticism borne of experience and limited budgets. Martinelli and his colleagues lacked a comprehensive testing and evaluation program with the resources and time to rigorously examine on-the-ground performance of such items as anticaking agents for salt piles, carbide inserts for plow blades, or calibration methods for ground-speed-controlled salt spreaders.

That is, until this year, when FHWA approved a pooled fund study, with Wisconsin as the lead state, to do just these kinds of studies. The Request for Proposal process will conclude in the summer of 2004, and usher in the first project or two for investigation. "Some Midwest states have been talking about this concept for three years," says Martinelli, the study's chair. "We've wanted to do it, but didn't have the funds."

Now they do. The program's annual budget will be about $170,000, with each participating state expected to kick in $25,000. Then we can see if the latest liquid road-ice treatment helps the midafternoon rush of Wisconsin I-894 drivers maintain traction on their way home from work.

Tom Martinelli, P.E.
Winter Operations Engineer

NATIONAL TRANSPORTATION RESEARCH

If money talks, then the WisDOT State Planning and Research budget shouts for the Transportation Research Board. Wisconsin's financial support to TRB amounts to a little more than 20 percent of WisDOT's annual SPR budget—about $680,000, of which $570,000 goes to TRB's National Cooperative Highway Research Program. Why the clamor? Because the voices of publications, committees, conference attendees and speakers, academicians, and transportation officials all draw extensively on TRB research and resources for the messages they script.

TRB—Premier Source of Transportation Information

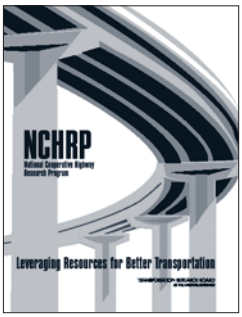
Without question, TRB's most important product is information. From NCHRP syntheses of state experiences to journal articles in the bimonthly *TR News* to the research newsletter e-mailed weekly to 12,000 subscribers, TRB manages, publishes and disseminates research on virtually every aspect of transportation.

In 2003 alone, TRB published 755 peer-reviewed papers in the 43 volumes of the TRB series *Transportation Research Record* and approximately 120 reports from the Cooperative Research Programs in hard copy, CD-ROM or Web-based format. NCHRP panels convened over 100 project meetings with emphasis on topics including security, bridges, agency management, pavement design and performance, traffic and operations, and safety.

TRB Puts Research to Work

In what may be its most brilliant achievement, TRB clearly demonstrates how transportation research bears fruit in the field. "Research Pays Off," a periodic feature in TRB's bimonthly TR News, shows how agencies employ the latest research in subject areas from Advanced Technology to Maintenance, Materials and Pavement to Transit and Waterways.

Review the entire collection of articles at *www4.trb.org/trb/onlinepubs.nsf/web/rpo_intro.*



For an overview of the value of NCHRP applied research, see the 16-page brochure "Leveraging Resources for Better Transportation" at *www4.trb.org/trb/crp.nsf/reference/boilerplate/Attachments/$file/NCHRPBrochure.pdf.*

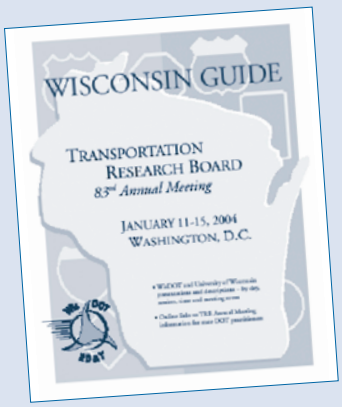
TRB Presentations Supported by WisDOT's Research Program

The Research Program funded some or all of the following work presented at TRB by these UW investigators. See the final reports at *www.dot.wisconsin.gov/library/research/reports*

Larry Banks, UW-Madison, *Rapid Strengthening of Reinforced Concrete Bridges,* Project 0092-02-14b.

Auckpath Sawangsuriya and Tuncer Edil, UW-Madison, *Soil Stiffness Gauge and Dynamic Cone Penetrometer for Earthwork Evaluation,* Project 0092-01-05.

Burak Tanyu, Craig Benson, Tuncer Edil and **Woon-Hyung Kim,** UW-Madison, *Equivalency of Crushed Rock and Three Industrial By-Products for Working Platforms During Pavement Construction,* Project 0092-45-18.



Sam Owusu-Ababio and **Robert Schmitt,** UW-Platteville, *Comparative Analysis of Distresses on Asphalt Shoulders Adjacent to Dowel- and Non-Dowel-Jointed Plain Concrete Pavements,* Project 0092-02-05.

Zhong-Ren Peng, Nathan Guequierre, Joseph Charles Blakeman, UW–Milwaukee, *Motorist Response to Arterial Variable Message Signs,* Project 0092-45-17.

Keith Knapp and **Xin Yi,** Deer-Vehicle Crash Patterns and Proposed Warning Sign Installation Guidelines, Project 0092-01-11.

Keith Knapp, *Deer-Vehicle Crash Countermeasures Toolbox: Application Decision and Choice Resource,* Project 0092-01-11.

TRB

Find a TRB Resource

A full list of TRB staff, each person's position and/or area of expertise, phone number, and an e-mail link can be found at *http://gulliver.trb.org/directory/trb_staff.asp*.

TRB Compendium of Papers

Technical details of new research can be found in TRB's annual Compendium of Papers CD-ROM, containing the full text of approximately 1,500 papers given at each year's meeting, searchable by topic, title, author or keyword. Contact the WisDOT Library or Research Section for copies of the CD. A subset of the Compendium is the Catalog of Practical Papers, comprising abstracts of some 400 papers in design, materials and construction research of immediate practical interest to state DOT professionals. Search the 2004 Catalog at *http://trb.org/am/ip/practical_papers.asp*.

TRB Staff—Ready to Help

We've all been stuck on a puzzling problem or gap in information. When even libraries and Web searches fail to help, TRB staff can usually lend the hand we need. A phone call to someone like Stephen Maher, an engineer who serves as liaison to almost two dozen standing technical committees on design, can quickly yield the name and phone number or e-mail address of an engineer in a neighboring state or a professor at a prominent research university, someone with the latest and best research in nearly any area of interest.

"You kind of have your finger on the pulse of the research program for your area," explains Maher of his work. "If (callers have) a question regarding research activities on a particular problem, I would find some resources for them or direct them to resources that can help them." As liaison to committees on design and pavement management, Maher advises on dozens of conferences a year, sorts hundreds of papers and assigns them to expert reviewers and committees, works the annual meeting, and visits one state every year to get a ground-level view of transportation agency needs. "You're not an expert," Maher says of the TRB liaisons, but "you know a lot of things about a lot of different areas."

And TRB doesn't just wait for phone calls. It also sends weekly updates on what is transpiring in the transportation research world—the TRB Transportation Research E-Newsletter. Lists of recent TRB publications; state, federal and international research news; announcements of awards; private sector developments; and legislative goings-on fill this indispensable update.

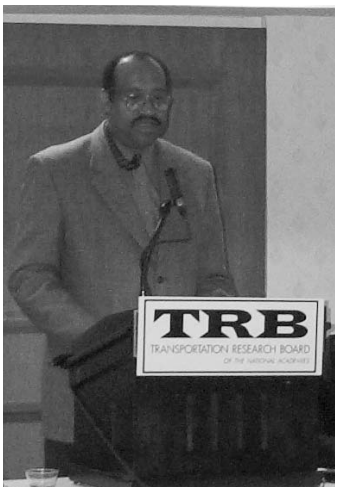
Editor Russell Houston, TRB's senior communications program officer, combs the Internet each week, picking out up to 40 news items, summarizing them, and providing links to more information. From week to week, Houston's selections reach 12,000 readers in all areas of transportation work. "If there's not something in there that interests you," Houston says, "the next week, next issue, there will be."

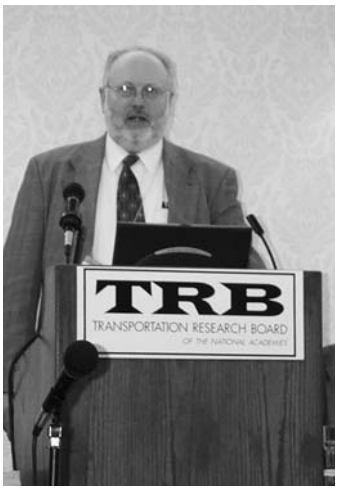
Stephen Maher
TRB Engineer of Design
smaher@nas.edu

Russell Houston
TRB Senior Program Officer, Communications
rhouston@nas.edu

WisDOT Staff Presentations at TRB

January 11-15, 2004





TOP **Nina McLawhorn,** WisDOT Research Administrator

Region III, National AASHTO Research Advisory Committee

BOTTOM **Jeff Western,** WisDOT Director of Infrastructure Security

Emerging Technologies for Transportation Security

BOTTOM **Ken Leonard,** WisDOT DTIM Deputy Administrator

State Management Perspectives on Uses and Importance of Data

TOP **Eugene Johnson,** WisDOT Director of the Bureau of Equity and Environmental Services

Issues Affecting DBEs' Ability to Compete

BOTTOM **John Etzler,** WisDOT Bureau of Transit and Local Roads

Transit Sector Socioeconomic Analysis Study, funded by WisDOT's Research Program.

Additional WisDOT presenters not pictured include:

John Corbin
Chief Traffic Engineer

Wisconsin's Road Weather Safety Action Plan

James Thiel
General Counsel

Sharing the Light: WisDOT Program to Develop, Fund, and Implement Fiber-Optic Highway by Contracting with Other Public Agencies

Martha Florey
Bureau of Transportation Safety

Abbreviated Traffic Record Assessment for St. Croix Chippewa of Wisconsin

Steven Krebs
Chief Pavements Engineer

Field Performance Evaluation of Type-C Fly Ash in Full-Depth Reclamation: Case History Study

WisDOT a Strong Presence at TRB Annual Meeting

It would be immodest to say that the 2004 TRB Annual Meeting, January 11 through 15, 2004 could not have been held without Dairy State contributions. But we can at least note that not a day passed without a Badger showing its stripes in at least one session. Of the 500-plus sessions held at the gathering of some 9,000 transportation professionals in Washington, D.C., 43 featured presentations by WisDOT officials, University of Wisconsin-system professors, or UW graduate students. Nine of those sessions were led by Wisconsin's own. For a complete listing of Wisconsin presentations at TRB 2004, see the Research Section's Wisconsin Guide at ***www.dot.wisconsin.gov/library/docs/trbguide.pdf.***

WisDOT Staff on TRB Committees

The WisDOT staff members listed here are directly involved in the work of the Transportation Research Board. They share their expertise on an ongoing basis with other transportation professionals from around the world – and gain new insights in turn from these technical interactions. Our TRB representatives help establish the research agendas of standing TRB technical committees and oversee the progress of national research as members of NCHRP project panels. All of us at WisDOT and all involved in Wisconsin transportation research benefit from the involvement of these individuals.

DTD Division of Transportation Districts

DTID Division of Transportation Infrastructure Development

DTIM Division of Transportation Investment Management

OGC Office of General Counsel

Balu Ananthanarayanan, *DTID*

NCHRP Project Panels on:

Visibility Performance Requirements for Vehicular Traffic Signals

Traffic Signal State Transition Logic Using Enhanced Sensor Information

Sandra Beaupre, *DTIM*

Committee on Transportation and Land Development

Scot Becker, *DTID*

NCHRP Project Panels on:

Effective Slab Width For Composite Steel Bridge Members

Heat-Straightening Repair of Damaged Steel Bridge Girders: Fatigue and Fracture Performance

Thomas Brokaw, *DTID*

NCHRP Project Panel on Quality Characteristics of Hot-Mix Asphalt Pavements for Use in Performance-Related-Specs

John Corbin, *DTID*

Committee on Freeway Operations

NCHRP Project Panels on:

Detailed Planning for Research on Providing a Highway System With Reliable Travel Time

Emergency Traffic Operations Management

Transportation Response Options: Scenarios of Infectious Disease, Biological Agents, Chemical, Biological, Radiological, or Nuclear Exposure

Leif Hubbard, *DTID*

Committee on Landscape and Environmental Design

Thomas Humber, *DTIM*

NCHRP Project Panel on Multimodal Arterial Level of Service

John Jackson, *DTID*

NCHRP Project Panel on Evaluation of Effectiveness of Small Scale In-Kind Wetland Replacement Projects Versus Out-of-Kind Mitigation Banks

Eugene Johnson, *DTID*

Committee on Disadvantaged Business Enterprises (DBE)

Steven Krebs, *DTID*

NCHRP Project Panel on Endurance Limit of Hot Mix Asphalt Mixtures to Prevent Fatigue Cracking in Flexible Pavements

David Larson, *DTID*

NCHRP Project Panels on:

Secure Communication Infrastructure

Methods for Determining Transportation and Economic Consequences of Terrorist Attacks

Alison Lebwohl, *DTID*

Committee on Maintenance and Operations Management

Kenneth Leonard, *DTIM*

Committees on:

Statewide Multimodal Transportation Planning

Transportation Programming, Planning, and Systems Evaluation

Conference on Census Data for Transportation Planning: Preparing for the Future

Task Force on Moving Activity-Based Approaches to Practice

NCHRP Project Panels on:

Incorporating ITS into the Transportation Planning Process

Research for AASHTO Standing Committee on Planning Support for Improved Transportation Planning and Project Development

Methods For Forecasting Statewide Freight Movements and Related Performance Measures

Detailed Planning for Research on Providing Highway Capacity in Support of the Nation's Economic, Environmental, and Social Goals

Support for Environmental Streamlining and Environmental Stewardship to Improve Transportation Planning and Project Development

Factors That Support the Planning-Programming Linkage

Wendy Maves, *DTD*

NCHRP Project Panel on TRAC PAC2 – A Hands-On Educational Program

Nina McLawhorn, *DTID*

Committee on Library and Information Science for Transportation

Donald Miller, *DTID*

NCHRP Project Panel on Best-Value Procurement Methods for Highway Construction Projects

Robert Newbery, *DTID*

Committees on:

Historic and Archeological Preservation in Transportation

Transportation History

NCHRP Project Panel on Review and Improvement of the Existing Processes and Procedures for Evaluating Cultural Resource

Thomas Notbohm, *DTID*

NCHRP Panel on Development of Guidelines to Improve Safety During Nighttime Construction or System Preservation Work

William Oliva, *DTD*

NCHRP Project Panels on:

Development of Portable Scour Monitoring Equipment

Effects of Debris on Pier Scour at Bridges

Karen Olson, *DTD*

NCHRP Project Panel on Highway Capacity Manual Applications Handbook

Robert Pearson, *DTID*

Committee on Waste Management in Transportation

Judie Ryan, *DTID*

NCHRP Project Panel on Improved Test Procedure for Determining the Moisture Damage Susceptibility of Bituminous Pavements

James Thiel, OGC

Committees on:

Legal Resources Group

Environmental Issues in Transportation Law

Transit and Intermodal Transportation Law

NCHRP Project Panel on Legal Problems Arising Out of Highway Programs

David Vieth, *DTID*

Committees on:

Maintenance and Operations Personnel

Winter Maintenance

Randall Wade, *DTID*

Committee on Intercity Rail Passenger Systems

Jay Waldschmidt, *DTID*

Committee on Transportation-Related Noise and Vibration

Jeffrey Western, *DTID*

Committees on:

Policy and Organization Group

Emerging Technology for Design and Construction

Information Systems and Technology

National Transportation Data Requirements and Programs

Critical Transportation Infrastructure Protection

Section – Data and Information Systems

Gary Whited, *DTID*

Committee on TRB Long-Term Pavement Performance (LTPP)

NCHRP Project Panels on:

Performance-Related Specifications for Hot-Mix Asphalt Construction

Issues Involving Delays in Completing Federal-Aid Highway and Bridge Projects

Mark Wolfgram, *DTIM*

NCHRP Project Panels on:

Analytic Tools Supporting Transportation Asset Management

Financial Management for Effective Program Delivery

Stanley Woods, *DTID*

Committee on General Structures

NCHRP Project Panels on:

Ongoing LRFD Bridge Design Specification Support

Service Life of Corrosion-Damaged Reinforced Concrete Bridge Superstructure Elements

Legal Truck Loads and AASHTO Legal Loads for Posting

Names of WisDOT committee members and NCHRP panel members courtesy of TRB.

WisDOT and Partner Committees

WisDOT Council on Research

Ron Adams, Division of Transportation Infrastructure Development
Bonnie Anderson, Division of Motor Vehicles
Rod Clark, Division of Transportation Investment Management
Jim Etmanczyk, Division of Business Management
Joe Maassen, Executive Offices
Dwight McComb, Federal Highway Administration
Dan McGuire, Division of State Patrol
Alan Rommel, Division of Transportation Districts

WisDOT Technology Advancement Unit

Khader Abu Al-eis, Technology Advancement Engineer
Debra Bischoff, Technology Advancement Engineer
Peter Kemp, New Products Engineer
Steve Krebs, Pavements Section Chief
David Larson, Technology Advancement Supervisor
Amanda Toepel, Technology Advancement Engineer
Joe Wilson, Technology Advancement Specialist

WisDOT/FHWA Library and Information Services Team

Wendy Brand, Librarian
Patrick Casey, CTC & Associates LLC
Mark Chandler, FHWA Technology Transfer Engineer
John Cherney, Head Librarian
Nina McLawhorn, Research Administrator
Rob Miller, Office of Public Affairs
Jean Trumpy, Waukesha District 2 Librarian

Midwest Regional University Transportation Center

Teresa Adams, Associate Director
Jason Bittner, Program Manager
Jackie Jiran, Research Manager
Howard Rosen, Continuing Education Director
Jeffrey S. Russell, Principal Investigator
Ernie Wittwer, Director

Wisconsin Highway Research Program

Peter Bosscher, Technical Director
Jackie Jiran, Program Manager

WHRP – Steering Committee

Teresa Adams, University of Wisconsin-Madison
Harry Lindberg, Wisconsin Earthmovers Association
Dwight McComb, Federal Highway Administration
Nina McLawhorn, WisDOT, Chair
Kevin McMullen, Wisconsin Concrete Pavement Association
Mike Paddock, American Council of Engineering Companies of Wisconsin
Alan Rommel, WisDOT
Scot Schwandt, Wisconsin Asphalt Pavement Association
Tom Walker, Wisconsin Transportation Builders Association

WHRP – Flexible Pavement Technical Oversight Committee

Hussain Bahia, UW-Madison
Tom Brokaw, WisDOT
Jim Crovetti, Marquette University
Erv Dukatz, Mathy Construction
Paulette Hana, WisDOT
Len Makowski, WisDOT, Chair
Signe Reichelt, Payne and Dolan
Judie Ryan, WisDOT
Bob Schmitt, UW-Platteville
Scot Schwandt, Wisconsin Asphalt Pavement Association
Wes Shemwell, Federal Highway Administration
Hani Titi, UW-Milwaukee

WHRP – Rigid Pavement Technical Oversight Committee

Tim Bolwerk, OMNNI Associates, Inc.
Steve Cramer, UW-Madison
James Crovetti, Marquette University
David Larson, WisDOT, Chair
Tom Lorfeld, WisDOT
Kevin McMullen, Wisconsin Concrete Pavement Association
Patrick O'Brien, Midwest Sales Group, Holcim (US) Inc.
Jim Parry, WisDOT
Bob Serak, WisDOT
Wes Shemwell, Federal Highway Administration

WHRP – GeoTechnics Technical Oversight Committee

Bob Arndorfer, WisDOT, Chair
Tuncer Edil, UW-Madison
Ken Hanzel, WisDOT
Sam Helwany, UW-Milwaukee
Harry Lindberg, Wisconsin Earth Movers Association
Bruce Pfister, WisDOT
Tom Strock, Federal Highway Administration
Paul Tarvin, STS Consultants Ltd.

WHRP – Structures Technical Oversight Committee

Gerry Anderson, WisDOT
Dave Bechthold, Zenith Tech, Inc.
Ed Fitzgerald, WisDOT
Chris Foley, Marquette University
Al Ghorbanpoor, UW-Milwaukee
Finn Hubbard, WisDOT
Jim Lucht, Earthtech
Mike Pheifer, Pheifer Brothers Construction
Joe Quist, Lunda Construction Company
Jeff Russell, UW-Madison
Tom Strock, Federal Highway Administration
Stan Woods, WisDOT, Chair
Bob Wysocki, HNTB Corporation

Wisconsin Department of Transportation

Research Coordination Section
4802 Sheboygan Ave., Rm. 451
P.O. Box 7965
Madison, WI 53707-7965
608-266-3199
www.dot.wisconsin.gov/library/research

2003 ANNUAL REPORT

Wisconsin Transportation Research

RESEARCH
PROJECT
REFERENCE
GUIDE

51 active projects

7 completed projects

16 new FFY 2004 awards

28 pooled fund projects

REFERENCE GUIDE

New Wisconsin Research Projects — FFY 2004

The projects listed below were selected for FFY 2004 funding by the respective research programs and their associated technical committees. Investigators are chosen based on their detailed proposals and work plans for meeting objectives outlined in the problem statements. Once projects are under way, quarterly reports of progress are posted on the Research and Library Web site at www.dot.state.wi.us/library/research/reports.

Project ID	Research Category	Project Title	Cost	Admin	Investigator Organization	WisDOT Contact
0092-04-05	Asphalt Pavement	Guidelines for the Surface Preparation and Rehabilitation of Existing Concrete and Asphaltic Pavements Prior to an Asphaltic Concrete Overlay	$64,966	WHRP	Bloom Consultants	leonard.makowski @dot.state.wi.us
0092-04-06	Asphalt Pavement	Life Cycle Cost Analysis of Stone Matrix Asphalt Pavements and SMA Application Guidelines	$54,498	WHRP	Eres Consultants	leonard.makowski @dot.state.wi.us
0092-04-07	Asphalt Pavement	Testing Wisconsin Asphalt Mixtures for the AASHTO 2002 Mechanistic Design Procedure	$75,000	WHRP	Michigan Technological University	leonard.makowski @dot.state.wi.us
0092-02-14	Bridges	Additional Funding for Rapid Strengthening of Reinforced Concrete Bridges	$13,940	WHRP	UW-Madison	stan.woods @dot.state.wi.us
0092-03-10	Bridges	Additional Funding for Integrated Field and Office Tools for Bridge Management	$8,000	WHRP	UW-Madison	stan.woods @dot.state.wi.us
0092-04-13	Bridges	Reducing Shrinkage Cracking of Structural Concrete Through the Use of Admixtures	$99,971	WHRP	UW-Milwaukee	stan.woods @dot.state.wi.us
0092-04-14	Bridges	Health Monitoring of Bridge Structures and Components Using Smart Structure Technology	$30,613	WHRP	Iowa State Univ. Center for Transportation Research and Education	stan.woods @dot.state.wi.us
0092-04-15	Bridges	Rapid Response Bridge Non-Destructive Evaluation (NDE)	$100,000	WHRP	UW-Milwaukee	stan.woods @dot.state.wi.us
0092-04-11	Concrete Pavement	Research and Development of the Application of FHWA's HiperPav Model to Wisconsin	$49,998	WHRP	The Transtec Group	david.larson @dot.state.wi.us
0092-04-12	Concrete Pavement	Expanded Study on the Effects of Aggregate Coating and Films on Concrete Performance	$149,995	WHRP	UW-Madison	david.larson @dot.state.wi.us
0092-04-08	Soils and Foundations	Application of Electromagnetic Geophysics (EMG) Technology to Subsurface Investigations	$29,824	WHRP	University of Kentucky	robert.arndorfer @dot.state.wi.us
0092-04-09	Soils and Foundations	Investigation of Standard Penetration Torque Testing (SPT-T) to Predict Pile Performance	$80,000	WHRP	Wagner Komurka Geotechnical Group, Inc.	robert.arndorfer @dot.state.wi.us
0092-04-10	Soils and Foundations	Monitoring and Evaluation of a Fly Ash Stabilized Subgrade Constructed by WisDOT	$84,603	WHRP	UW-Madison	robert.arndorfer @dot.state.wi.us
0092-01-09	Environment	Additional Funding for Fresh Water Mussel Study	$20,000	COR	Department of Natural Resources	gary.birch @dot.state.wi.us
0092-04-04	Environment	Pollutant Loading to Storm Water Run-Off from Highways: Impact of a Highway Sweeping Program – Phase II	$150,000	COR	U.S. Geological Survey	thomas.martinelli @dot.state.wi.us
0092-04-01	Policy and Planning	Development of a Mechanism to Measure Customer Satisfaction With Products and Services of the Department - Phase II	$180,000	COR	Virchow, Krause & Company	john.nordbo @dot.state.wi.us
			$1,191,408			

Pooled Fund Research Projects

WisDOT is currently participating in the pooled fund projects identified below. Details of each project are on the WisDOT Research & Library Web site at www.dot.state.wi.us/library/research/reports/pooledfund.htm and on the Transportation Pooled Fund Web site www.pooledfund.org.

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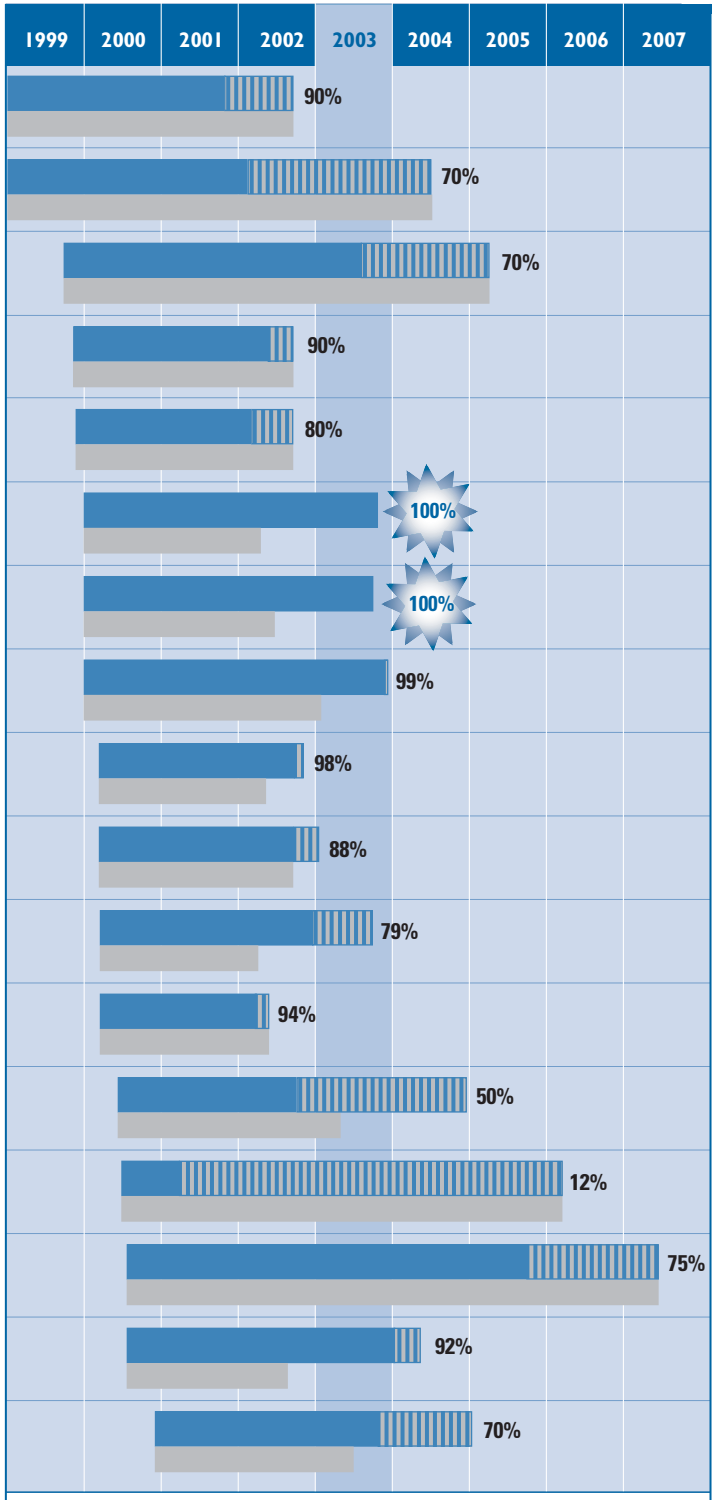
Project ID	Research Category	Project Title	WisDOT Pledge through 2003	WisDOT Contact
TPF-5(021)/ SPR-3(044)	Asphalt Pavement	Base Funding for the North Central Superpave Center	$140,000	john.volker @dot.state.wi.us
na*	Asphalt Pavement	Design, Construction and Performance of 4.75mm Superpave Designed Mixes	$15,000	leonard.makowski @dot.state.wi.us
TPF-5(080)*	Asphalt Pavement	Investigation of Low Temperature Cracking in Asphalt Pavements	$50,000	leonard.makowski @dot.state.wi.us
TPF-5(005)	Bridges	FHWA Curved Steel Bridge Test	$30,000	stan.woods @dot.state.wi.us
TPF-5(068)*	Bridges	Long-Term Maintenance of Bridge Load Resistance Factor Design Specification	$10,000	stan.woods @dot.state.wi.us
TPF-5(066)	Concrete Pavement	Material and Construction Optimization for PCC Pavements	$30,000	david.larson @dot.state.wi.us
TPF-5(014)	Concrete Pavement	Advanced Research of an Image Analysis System for Hardened Concrete	$20,000	david.larson @dot.state.wi.us
TPF-5(075)*	Concrete Pavement	Extending the Season for Concrete Construction and Repair–Phase II, Defining Engineering Parameters	$10,000	david.larson @dot.state.wi.us
SPR-2(212)	Soils and Foundations	Non-nuclear Testing of Soils and Granular Bases Using the GeoGauge	$24,000	robert.arndorfer @dot.state.wi.us
SPR-2(218)	Soils and Foundations	Determining the Durability of Modular Retaining Wall Blocks	$50,000	robert.arndorfer @dot.state.wi.us
SPR-3(065)	Soils and Foundations	Geosynthetic Reinforcement of the Base Course Layer of Flexible Pavements	$20,000	robert.arndorfer @dot.state.wi.us
TPF-5(001)	Soils and Foundations	Soil Mixing Methods for Hwy Application	$60,000	robert.arndorfer @dot.state.wi.us
TPF-5(076)*	Soils and Foundations	Development of Geotechnical Procedures/Operations Manual	$10,000	robert.arndorfer @dot.state.wi.us
TPF5(008) SPR-2(183)	Operations	Development of Computer-Based Training (CBT) Lessons (Web-Based Learning Project) for Engineers, Specialists, Technicians	$40,000	jerry.zogg @dot.state.wi.us
SPR-2(207)	Operations	USDOT FHWA Transportation Management Center	$75,000	john.corbin @dot.state.wi.us
SPR-3(104)	Operations	Computer Based, Self-Operating Training System on Anti-Icing/Road Weather Information Systems (AI/RWIS)	$30,000	thomas.martinelli @dot.state.wi.us
TPF-5(063)	Operations	Improving Quality of Pavement Profiler Measurement	$80,000	steve.krebs @dot.state.wi.us
TPF-5(065)	Operations	Traffic Control Device Consortium	$25,000	thomas.notbohm @dot.state.wi.us
TPF-5(046)	Operations	Transportation Curriculum Coordination Council Training Management and Development	$15,000	jerry.zogg @dot.state.wi.us
TPF-5(073)	Operations	Portable Non-Intrusive Technologies Consortium	$15,000	john.corbin @dot.state.wi.us
TPF-5(086)*	Operations	Reducing Crashes at Rural Intersections: Toward a Multi-State Consensus on Rural Intersection Decision Support	$25,000	david.vieth @dot.state.wi.us
TPF-5(092)*	Operations	Test and Evaluation of Materials, Equipment and Methods for Winter Highway Maintenance	$25,000	thomas.martinelli @dot.state.wi.us
TPF-5(036)	Policy and Planning	Transportation Asset Management Pooled Fund Research Program	$300,000	nina.mclawhorn @dot.state.wi.us
TPF-5(087)	Policy and Planning	Electronic Appraisal Development Study Phase 1	$10,000	rebecca.krugman @dot.state.wi.us
SPR-3(017)	Safety	Midwest States Crash Testing Program	$410,471	beth.cannestra @dot.state.wi.us
SPR-3(075)	Safety	Midwest States Smart Work Zone Deployment Initiative (MwSWZDI)	$172,780	thomas.notbohm @dot.state.wi.us
SPR-3(076)	Safety	Animal-Vehicle Crash Mitigation Using Advanced Technologies	$50,000	john.kinar @dot.state.wi.us
TPF-5(058)	Safety	Safety Implementation Guides [managed under NCHRP 17-18(3)]	$50,000	david.vieth @dot.state.wi.us

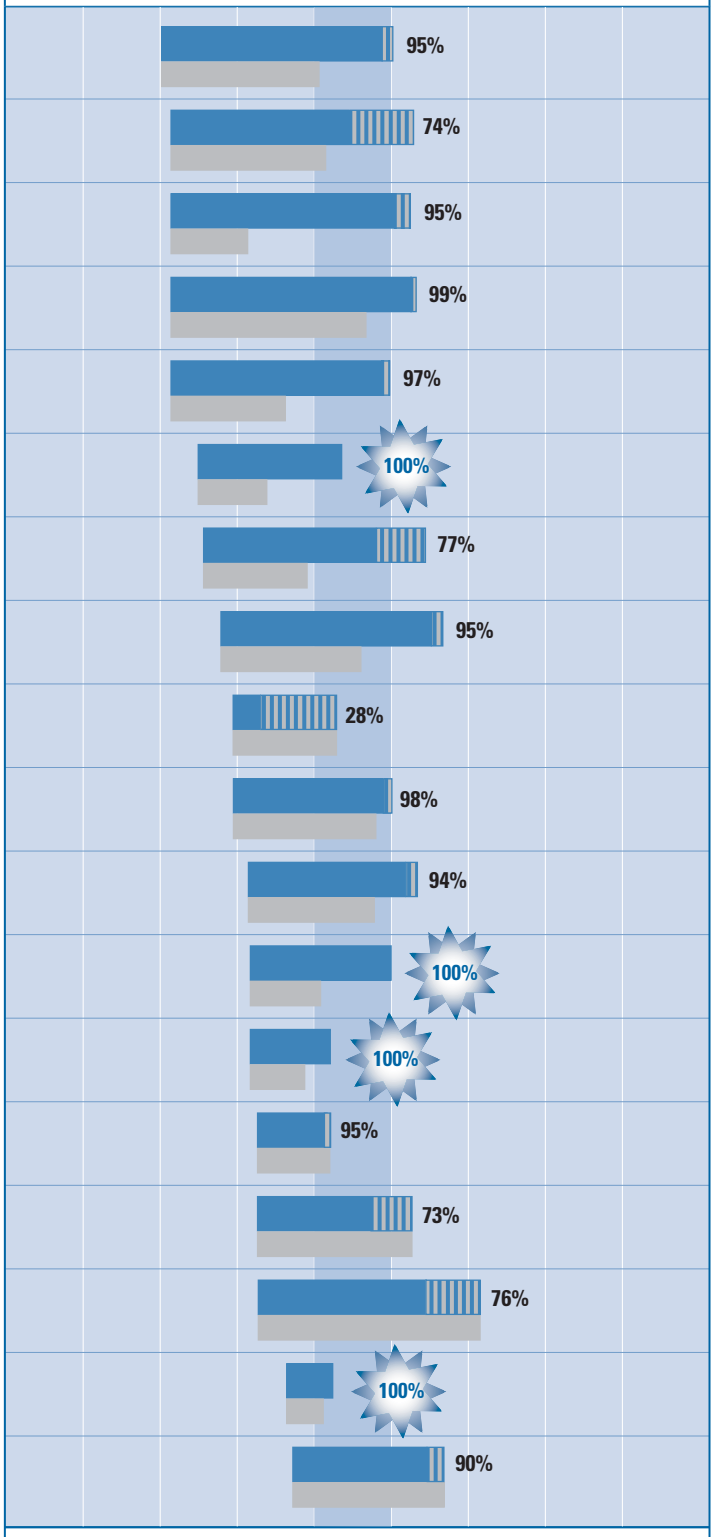
** New in FFY 2004.*

Progress of Active Research Projects — FFY 2003

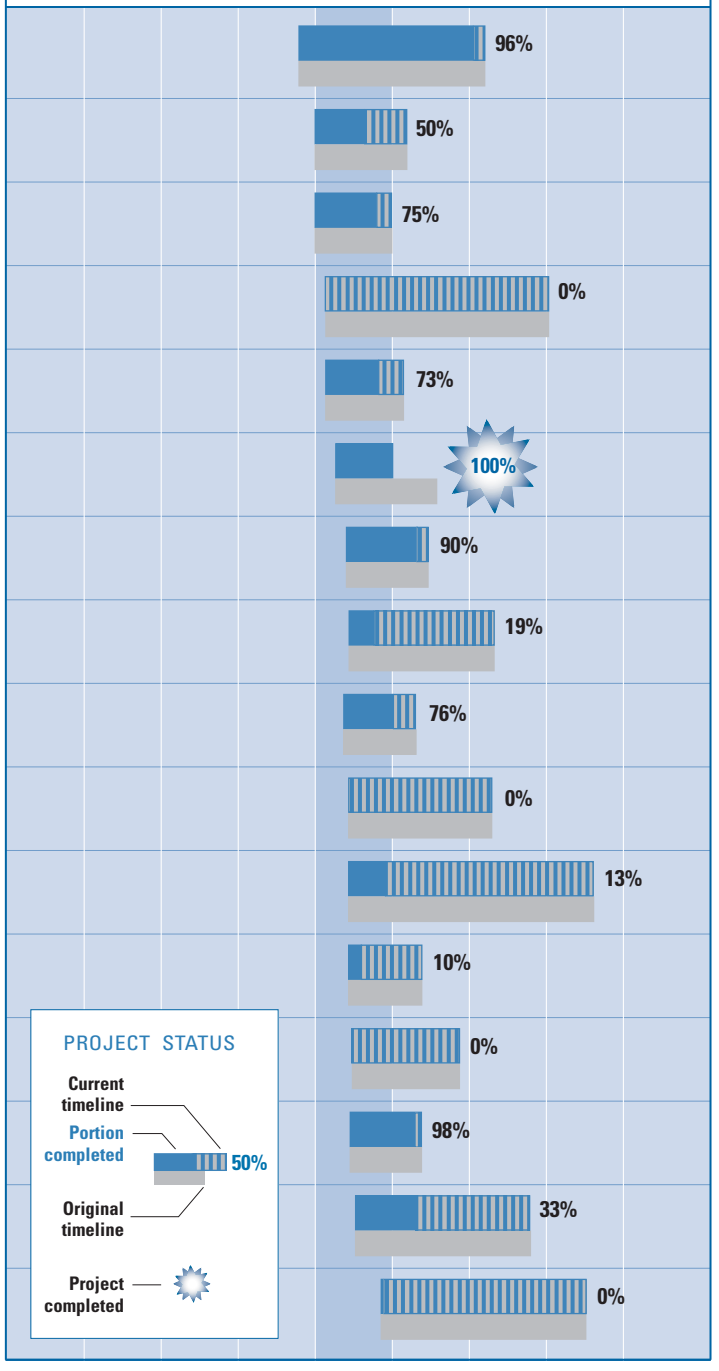
Project ID	Primary category	Performing organization	Investigator	Admin	Cost	WisDOT contact	Project title
0092-45-52	Asphalt Pavement	Wisconsin Department of Transportation	Debra Bischoff	TAU	$21,000	david.larson @dot.state.wi.us	Recycling Rubber Modified Asphalt
0092-45-79	Concrete Pavement	Marquette University	James Crovetti	TAU	$72,556	david.larson @dot.state.wi.us	Cost Effective Concrete Pavement Cross Sections
0092-00-20	Concrete Pavement	Wisconsin Department of Transportation	Debra Bischoff	TAU	$125,000	david.larson @dot.state.wi.us	Investigative Study of the Italgrip System
0092-45-15	Soils and Foundations	University of Wisconsin-Madison	Tuncer Edil	WHRP	$55,000	robert.arndorfer @dot.state.wi.us	Effectiveness of Geosynthetics in Stabilizing Soft Subgrades
0092-45-18	Soils and Foundations	University of Wisconsin-Madison	Tuncer Edil	WHRP	$95,000	kenneth.hanzel @dot.state.wi.us	Field Performance of Sub-bases Constructed with Industrial Byproducts
0092-00-04	Asphalt Pavement	University of Wisconsin-Madison	Hussain Bahia	WHRP	$45,776	leonard.makowski @dot.state.wi.us	Minimum Pavement Thickness for Superpave Mixes
0092-00-07	Concrete Pavement	University of Wisconsin-Madison	Steven Cramer	WHRP	$97,740	david.larson @dot.state.wi.us	Effects of Aggregate Coatings and Films on Concrete Performance
0092-00-12	Soils and Foundations	University of Wisconsin-Madison	Craig Benson	WHRP	$100,616	robert.arndorfer @dot.state.wi.us	Equivalency of Subgrade Reinforcement Methods
0092-45-98	Asphalt Pavement	University of Wisconsin-Madison	Hussain Bahia	WHRP	$80,001	leonard.makowski @dot.state.wi.us	Field and Lab Evaluation of Superpave Mixtures Designed with Different PG Grades and Aggregate Angularity
0092-00-05	Asphalt Pavement	Marquette University	James Crovetti	WHRP	$45,000	leonard.makowski @dot.state.wi.us	Development of Rational Overlay Design Procedures for Flexible Pavements
0092-00-08	Concrete Pavement	Marquette University	Alex Drakopuolos	WHRP	$75,000	david.larson @dot.state.wi.us	Wet Pavement Crash Study of Longitudinally and Transversely Tined PCC Pavements
0092-00-15	Bridges	University of Wisconsin-Milwaukee	Al Ghorbanpoor	WHRP	$49,745	stan.woods @dot.state.wi.us	Non-Destructive Testing of Highway Bridge Structures for Purposes of Structure Evaluation
0092-00-01	ITS	University of Wisconsin-Milwaukee	Edward Beimborn	COR	$190,000	ronald.morse @dot.state.wi.us	Evaluation of Implementation Issues for Automatic Vehicle Locator (AVL) Systems for WI Transit Services
0092-00-11	Concrete Pavement	Marquette University	James Crovetti	WHRP	$39,857	david.larson @dot.state.wi.us	Portland Cement Concrete Pavement over Rubblized PCC
0092-00-13	Soils and Foundations	University of Wisconsin-Milwaukee	Sam Helwany, Al Ghorbanpoor	WHRP	$99,979	robert.arndorfer @dot.state.wi.us	Evaluation of Bridge Approach Settlement Mitigation Methods
0092-00-16	Bridges	Marquette University	Chris Foley	WHRP	$49,969	stan.woods @dot.state.wi.us	Structural Analysis of Sign and Luminaire Supports
0092-00-03	Environment	United States Geological Survey	Judy A. Wierl	COR	$75,000	robert.pearson @dot.state.wi.us	Evaluation of Storm Water Treatment Technologies for Highway Run-Off



0092-45-17	ITS	University of Wisconsin-Milwaukee	Bin Ran	COR	$150,000	john.corbin @dot.state.wi.us	Benefit Evaluation of Ramp Meters and Variable Message Signs in Wisconsin
0092-01-02	Asphalt Pavement	University of Wisconsin-Madison	Hussain Bahia	WHRP	$55,337	leonard.makowski @dot.state.wi.us	Using the Gyratory Compactor to Measure Mechanical Stability of Asphalt Mixes
0092-00-14	Soils and Foundations	Wagner Komurka Geotechnical Group, Inc	Alan Wagner	WHRP	$30,000	robert.arndorfer @dot.state.wi.us	Estimating Pile Setup in Wisconsin
0092-01-01	Asphalt Pavement	University of Wisconsin-Madison	Hussain Bahia	WHRP	$99,828	leonard.makowski @dot.state.wi.us	Guidelines for Selection of Performance Graded Binders for Wisconsin
0092-01-03	Asphalt Pavement	University of Wisconsin-Madison	Hussain Bahia	WHRP	$50,753	leonard.makowski @dot.state.wi.us	Evaluation of the Extent of Hot-Mix Asphalt (HMA) Moisture Damage as it Relates to Pavement Performance
0092-01-07	Policy and Planning	The Dieringer Research Group, Inc.	Laura Cleary	COR	$60,000	sue.hunter @dot.state.wi.us	Examining Stress Levels of State Patrol Enforcement Personnel and Intervention Techniques
0092-01-06	Bridges	University of Wisconsin-Milwaukee	Habib Tabatabai	WHRP	$124,968	stan.woods @dot.state.wi.us	Rehabilitation Techniques for Concrete Bridges
0092-01-05	Soils and Foundations	University of Wisconsin-Madison	Tuncer Edil	WHRP	$58,803	robert.arndorfer @dot.state.wi.us	Evaluation of the Dynamic Cone Penetrometer and Soil Stiffness Gauge for Measuring Subgrade Stability
0092-01-04	Concrete Pavement	Marquette University	James Crovetti	WHRP	$58,648	david.larson @dot.state.wi.us	Early Opening of Portland Cement Concrete Pavements to Traffic
0092-01-09	Environment	Wisconsin Department of Natural Resources	Ed Emmons	COR	$100,000	gary.birch @dot.state.wi.us	Fresh Water Mussel Study
0092-02-01	Soils and Foundations	OMNNI Associates, Inc	Richard R. Reusser	WHRP	$99,972	robert.arndorfer @dot.state.wi.us	Support Strength of Crushed Aggregate Base Course Due to Gradational, Regional and Source Variations
0092-02-05	Concrete Pavement	University of Wisconsin-Platteville	Samuel Owusu-Ababio	WHRP	$73,467	david.larson @dot.state.wi.us	Performance of Shoulders Adjacent to Concrete Pavements
0092-02-08	Policy and Planning	University of Wisconsin-Milwaukee	Robert Eger III	COR	$64,859	allyn.lepeska @dot.state.wi.us	Wisconsin's Off-Road Fuel-Tax Collection Process: A Midwestern Comparative Analysis and Assessment
0092-02-14	Bridges	University of Wisconsin-Madison	Larry Bank	WHRP	$59,069	stan.woods @dot.state.wi.us	Rapid Strengthening of Reinforced Concrete Bridges
0092-02-14	Concrete Pavement	University of Wisconsin-Madison	Steven Cramer	WHRP	$194,251	david.larson @dot.state.wi.us	Effects of Ground Granulated Blast Furnace Slag in PCC
0092-02-14	Asphalt Pavement	University of Wisconsin-Madison	Jeffrey Russell	WHRP	$225,321	leonard.makowski @dot.state.wi.us	The Effect of Pavement Lift Thickness on Superpave Mix Permeability and Density
0092-02-10	Policy and Planning	The Dieringer Research Group, Inc.	Richard Yob	COR	$100,000	gary.wentz @dot.state.wi.us	Evaluating the Effectiveness of the Occupational Licensing Program
0092-02-16	Policy and Planning	Cambridge Systematics	Daniel Krechmer	COR	$80,000	phil.decabooter @dot.state.wi.us	Development of Methods for Benefits Assessment of ITS Deployment in Wisconsin – Phase II



0092-03-12	Soils and Foundations	University of Wisconsin-Madison	Tuncer Edil	WHRP	$120,034	robert.arndorfer @dot.state.wi.us	Methodology to Include Strength Contribution of Select Subgrade Materials in Pavement Structures
0092-03-02	Policy and Planning	Wisconsin Department of Transportation	Jeffrey Knupp	COR	$12,000	jeffrey.knupp @dot.state.wi.us	Inventory of Electronic Judicial Systems in Wisconsin
0092-03-06	Policy and Planning	Wisconsin Department of Transportation	Dennis Leong	COR	$50,000	dennis.leong @dot.state.wi.us	Highway 29 Impact (from Abbotsford to Green Bay)
0092-02-03	Soils and Foundations	Virginia Poly-technic Institute & State University	Richard E. Weyers, P.E.	WHRP	$202,084	robert.arndorfer @dot.state.wi.us	Testing Methods to Determine Long-Term Durability of Wisconsin Aggregate Resources
0092-02-13	Asphalt Pavement	Rowan University	Yusef Mehta	WHRP	$49,558	leonard.makowski @dot.state.wi.us	Evaluation of Interlayer Bonding in HMA Pavements
0092-03-08	Policy and Planning	Opinion Dynamics Corporation	Larry Shiman	COR	$100,000	scott.bush @dot.state.wi.us	Wisconsin Information System for Local Roads (WISLR) Communication Analysis
0092-03-07	Policy and Planning	HLB Decision Economics Inc.	Khalid Bekka	COR	$100,000	john.etzler @dot.state.wi.us	Transit Benefit Sector Analysis
0092-03-09	Bridges	University of Wisconsin-Madison	Jose Pincheira	WHRP	$91,740	stan.woods @dot.state.wi.us	Evaluation of Concrete Deck and Crack Sealers
0092-03-10	Bridges	University of Wisconsin-Madison	Teresa Adams	WHRP	$67,538	stan.woods @dot.state.wi.us	Integrated Field and Office Tools for Bridge Management
0092-03-11	Soils and Foundations	University of Wisconsin-Milwaukee	Hani Titi	WHRP	$103,049	robert.arndorfer @dot.state.wi.us	Determination of Typical Resilient Modulus Values for Selected Soils in Wisconsin
0092-03-13	Asphalt Pavement	University of Wisconsin-Madison	Hussain Bahia	WHRP	$125,006	leonard.makowski @dot.state.wi.us	Field Validation of Wisconsin Modified Binder Selection Guidelines
0092-03-01	Policy and Planning	Wisconsin Department of Transportation	Deanne Boss	COR	$58,600	sue.hunter @dot.state.wi.us	Examining Stress Levels of State Patrol Enforcement Personnel and Intervention Techniques - Phase II
0092-03-14	Asphalt Pavement	Marquette University	James Crovetti	WHRP	$99,891	leonard.makowski @dot.state.wi.us	Development of Modulus-to-Temperature Relations for HMA Mixtures in Wisconsin
0092-03-15	Asphalt Pavement	Rowan University	Yusef Mehta	WHRP	$34,991	leonard.makowski @dot.state.wi.us	Investigation of New Devices for Use in Determining Mechanistic Properties and Performance
0092-03-16	Concrete Pavement	Michigan Technological University	Lawrence Sutter	WHRP	$199,965	david.larson @dot.state.wi.us	Evaluation of Methods for Characterizing Air Void Systems in Wisconsin Paving Concrete
0092-04-10	Soils and Foundations	University of Wisconsin-Madison	Tuncer Edil	WHRP	$84,603	robert.arndorfer @dot.state.wi.us	Monitoring and Evaluation of a Fly Ash Stabilized Subgrade Constructed by WisDOT



Years shown are Federal Fiscal Years – October 1 through September 30. Project timelines are current as of September 30, 2003.